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DR. S. HIRAL—Chief Adviser to the Chinese Board of Communications

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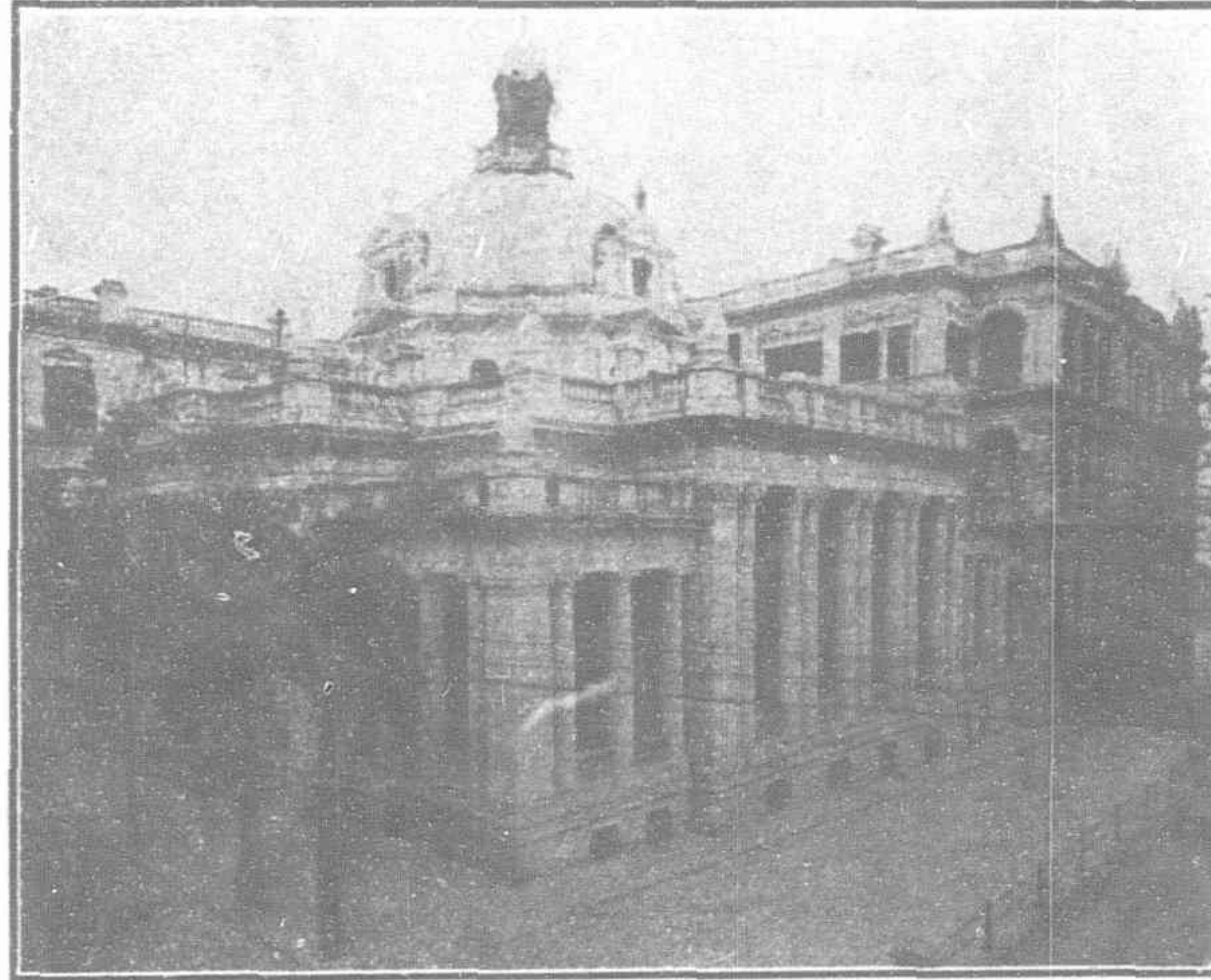
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THE FAR EASTERN REVIEW

COMMERCE :: ENGINEERING :: FINANCE

VOL. X.

SHANGHAI AND MANILA, SEPTEMBER 1913

No. 4

PROPOSED PARLIAMENT BUILDING AT PEKING

On a plot of land some seven hundred by two thousand feet square—the site of the old Examination Halls—situated in the south-east corner of the Tartar City of Peking a large amount of work has been done on foundations designed for a magnificent pile of buildings to serve as the National Houses of Parliament.

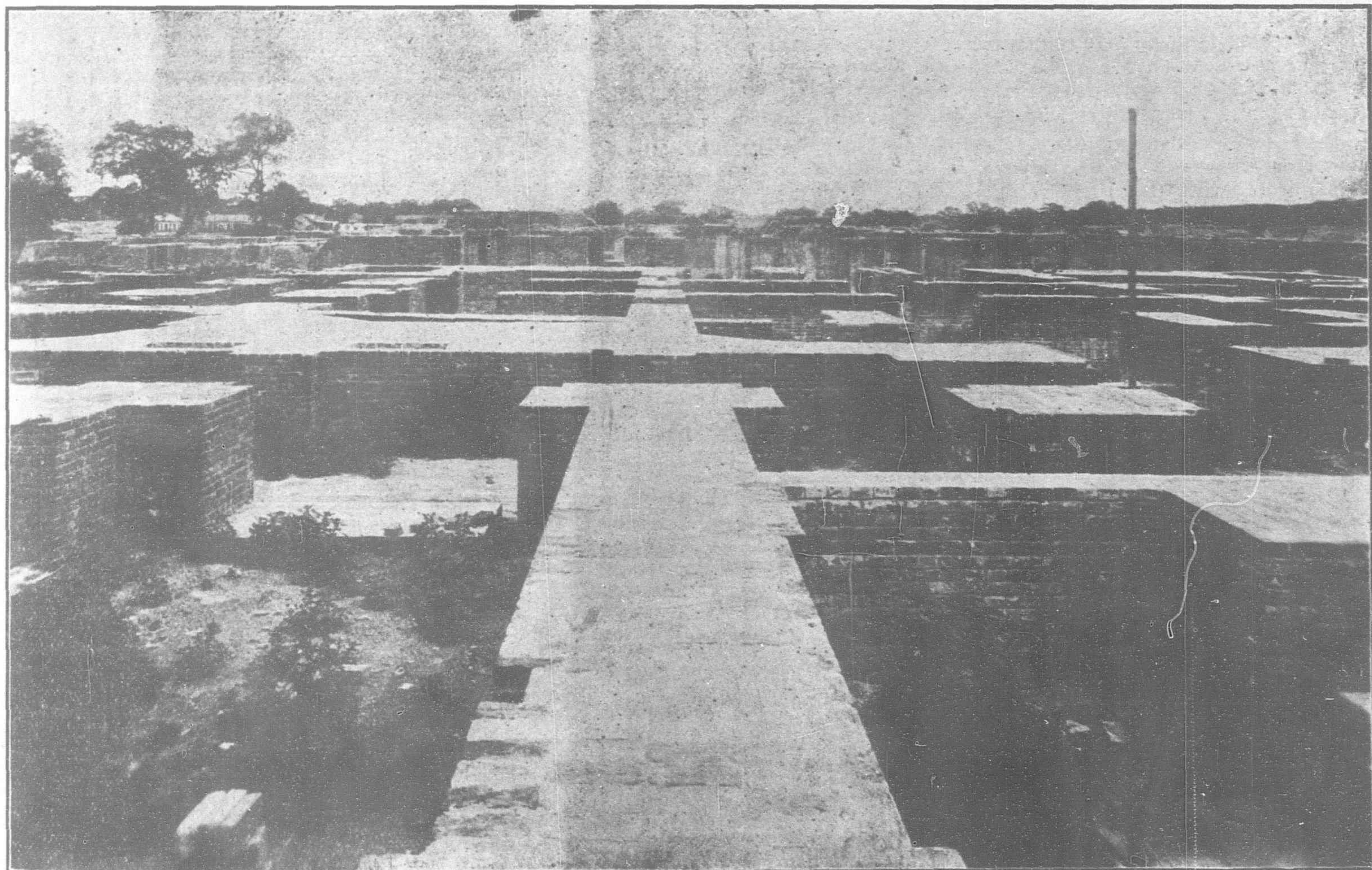
The Revolution of 1911-12 stopped construction work completely, and, for financial reasons, all efforts of architect

and builders to obtain permission from the Republican Government to resume operations have failed to awaken favorable response.

It is significant that the design was made at the instigation of, and work was commenced by, the reactionary Manchu *régime* and that it has been suspended—perhaps with reluctance—by the progressive Republicans. The claim now is, however, that the Government will shortly instruct that the work be carried to

completion. In such an event China will have one of the finest Parliamentary buildings in the world. The design provides for most modern equipment in every respect, and great care has been devoted by the architect to the minutest details.

By reference to the illustration accompanying this article it will be seen that the architecture is of the modern classical order; the treatment providing a most æsthetic, compact, well-balanced,



Foundations of New Parliament Building, Peking

Photo by Le Munyon, Peking

and practical edifice. Legislative Chambers, ministerial, committee, and party rooms, offices, refreshment halls, and other essential subsidiary accommodation are contained beneath the one roof and so arranged as to give the greatest service with the maximum of comfort and utility and the minimum of waste space and loss of time in communication.

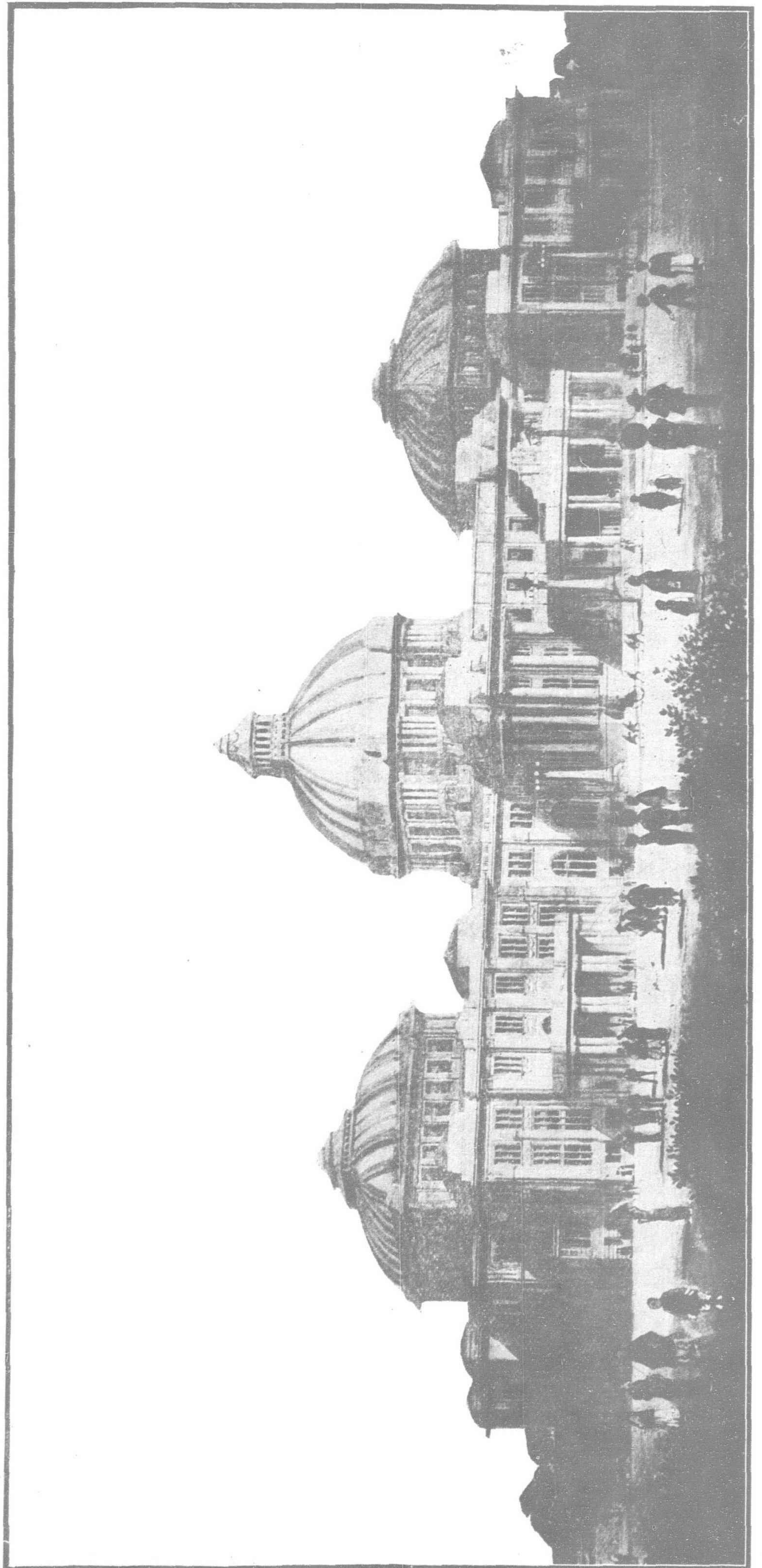
What is it that the architect hopes the coming generations of Chinese will see as the seat of their legislative activities? Entering through massive and distinctive gateways, the spectator will observe before him an impressive structure of four storeys in stone and reinforced concrete made striking by stately columns and three surmounting cupolas, the central one dominating and affixing the seal of solidity established in the design of the walls. The small cupolas rise immediately over the Senate and House of Representatives respectively, and it will be observed that the design is such that the sections of the building to the right and left of the central division—which is devoted to the main entrance and marked by the great dome and large portico—are identical, their similarity being also carried out in the interior arrangements.

A carriage drive will lead to the main entrance by a ramp ascending beneath a handsome portico, when the visitor will, by two flights of seven steps each, reach the main entrance hall. A striking array of seventy-two marble columns, arranged in groups of four, will support the decorated ceiling. On either side lifts and stairways will give communication with the floors above, while accommodation will be provided in the immediate vicinity for members' cloaks and for the House attendants.

Another flight of seven steps will communicate with the large reception room, capable of seating 1,200 people. Octagonal in shape, illuminated by an artistically designed lead-light ceiling 60 feet high, with decorated walls and with a symmetrical sweep of pillars and arches, it will be a beautiful hall. In the centre will be a large platform reached by seven steps, for high officials attending any function, while three more steps will lead to a higher dais, where the President will sit on important State occasions. Directly to the rear of this platform will be a retreat for the President, leading to the President's private apartments or the great stairway hall 45 feet by 24 feet, at the back of the building, where will be provided a private entrance for the President and Ministers.

On three sides of the reception hall above referred to will be a gallery capable of seating 350 visitors. It will be in this hall that openings of Parliament will take place, in which case the gallery will be for the accommodation of the visiting public.

This chamber will be immediately beneath the central dome, and will obtain its light therefrom. Round the outside



The Future Home of China's Parliament. When completed this will rank among the finest Parliament Buildings in any part of the world

of the chamber will extend a corridor fifteen feet in width, decorated with columns, whence communication will be secured with the Senate on the right and the House of Representatives on the left.

A special front entrance to each House will be provided, which is indicated on the illustration by the small porticos to the left and right of the main entrance. Each Chamber will be 85 feet in length by 70 feet in depth, and may be reached by way of special entrance hall, equipped with stairways and lifts. The architect has so designed these sections of the building that members of parliament, and officials, will have absolute immunity from public interference. From the main entrance hall a broad stairway will lead to the first floor and corridor round the Chambers. Three doorways on each side of this hall will give access to members, while officials will have private entrances at each end of the building. The public may only enter the gallery of the Chamber by taking a stairway or lift which will be specially provided in the basement. Near each Chamber rooms will be provided for the President of the House and the staff, while seven rooms will also be arranged near each Chamber for Ministers and high officials, with private entrances to the Chambers.

A hall 36 feet wide and 66 feet long will extend from one Chamber to the other, which will also give access to the refreshment rooms, lavatories, etc.

Each Chamber will be provided with semi-circular seating accommodation, the Senate facing the North and the House of Representatives the South. The furniture for these legislative halls will be of most modern description and in keeping with the general decorative style adopted throughout.

The second floor will provide entrance to the galleries of the Chambers, press rooms, waiting rooms, refreshment room for strangers and lavatories. A feature of the press rooms will be the special telephone and telegraphic installations.

On the third floor Committee and party rooms providing considerable accommodation will be arranged, while at the rear of the central dome the library will be established, with reading and writing rooms on each side for the members of the two Houses. The members' telephone and telegraph rooms will also be provided on this floor at convenient places.

The staff of attendants will be accommodated in the attic rooms.

Altogether there will be 28 staircases, most of them leading from the basement up to the various floors through the walls. These have been so contrived as to prevent confusion, and will assure the utmost possible privacy for members and officials. The stairways for the public will lead to nowhere but those places in the Houses where the public will be admitted.

Special attention will be given to the installation of lighting and heating plants; the latter will be so arranged as to permit of sections of the building being heated either by hot air or water without a waste of heat in unoccupied portions.



DR. S. HIRAI, Chief Adviser to the Chinese Board of Communications

The most up-to-date sanitary equipment will also be provided, and the kitchens, in the basement, will be equipped with the best available cooking arrangements. All pantries will be connected by special food lifts running to the refreshment rooms and upper floor.

The foundations of the building will be of concrete twelve feet in depth, and the same material, reinforced, will be used throughout the building, especially in the roof and cupolas. The basement will be of granite, obtainable at the western hills, whence will also come whatever sandstone or marble that is used.

The design of the building has been made by Dr. C. Rothkegel, who was assisted by eight European and five Chinese architects and draughtsmen in working up the innumerable plans. The minutest care has been taken to obtain a final assemblage of material without miscalculation, and the work devoted to this important part of the scheme has been painstaking and tedious, reflecting the highest credit upon the architect and those assisting him. Details for every portion of the great building have been prepared, and the architect awaits nothing but the money to commence work and carry it on to speedy conclusion.

CHIEF RAILWAY ADVISER TO CHINA

In regard to Dr. Seijiro Hirai, Railway Technical Adviser to China, the special commissioner in the East of *The Engineer* wrote at the time of Dr. Hirai's appointment as follows:—

Dr. Hirai was born in 1855. He was sent by the Japan Government to study engineering at Troy, U.S.A., in 1875, and there obtained his engineering degree. He returned to Japan in 1880 and filled the position of chief engineer to the Tanko Railway till 1894, when he became attached to the Imperial Government Railways. He steadily rose to the position of President of the Imperial Railways; this was before the creation of the Railway Board. On the creation of the Board he became Vice-President, which position he filled till quite recently.

When I was in China there was a great deal of speculation about this position, as it was well known that the government contemplated such an appointment. No one, however, had any idea that anyone outside the present circle of Chinese railwaymen would be selected, and it will come as a surprise that a Japanese engineer has been appointed.

Of Dr. Hirai's experience and ability as an engineer there can be no doubt. He is held in the highest respect by the officials and men of the Japanese Railways, and that his country honours him is proved by the fact that he is one of the non-hereditary members of the house of peers. He has a personal charm which cannot fail to make him popular.

Nationality counts for a great deal among foreigners in China. Personally, I confess that

I am sorry a Briton was not selected for this position, and others will doubtless be sorry that a Frenchman or a German or an American did not receive the appointment. The one thing that should unite railwaymen to support Dr. Hirai is that he is by ability, training, and experience an engineer worthy of the position.

Dr. Hirai will be well advised if he declines to join in the insane movement to rid the Chinese Railways of their best friends, the foreign engineer and manager. The experience of his own country in this matter should make him careful, for, but for the undue haste in filling responsible positions with Japanese subjects—experienced and able or otherwise, it little matters—Japan would to-day have been supporting a large industrial community as the result of the investment of foreign capital.

SINGAPORE HARBOUR IMPROVEMENTS

RECLAMATION AND BOAT HARBOUR

The extensive harbour works to the west in Keppel Harbour, the wharves and the Lagoon Dock, have recently been described, and public attention has been drawn to them, says the *Singapore Free Press*, and continues:—The eastern works, those in the Roads, while perhaps more "in the public eye" literally, are less understood and their extent and future influence on the domestic commerce of Singapore are less appreciated.

Two distinct works are going on in the Roads. In the first place Pulau Obin is being transported to the Roads and put down in the shape of a Mole, to form a safe and protected inner harbour, where local vessels can anchor and load and discharge into tongkangs, secure from the disturbance of China Sea rollers, or the equally troublesome rough water resulting from a strong S. W. wind or local storm. The only point of the history of the long controversy as to the necessity of these works that need be touched on, is the persisting fact that Singapore River is utterly inadequate and unsuitable for the large tongkang traffic that is needed for our trade. Therefore provision has to be made otherwise. The Mole is to shelter the ships and tongkangs while loading and discharging; the Reclamation and Tongkang Harbour is to land and embark goods from the Mole.

THE MOLE.

This protective work has probably come in for more criticism than any other of our harbour works. It is 5,000 feet long, and at present looks very unfinished and irregular. Yet we are assured that the Mole is steadily approaching stability. The quantity of stone originally estimated to be required for the final completion is not likely to be exceeded, and settlements of the kind which have long been obvious to all observers, were fully anticipated and allowed for in the original estimates. The settlements are not abnormal, and the work is steadily progressing towards completion. For motives of economy it will remain an unfaced Mole.

The more important question of the effect of the Mole in carrying on harbour work has two aspects—does it protect ships at work? has it improved the anchorage? There can be no two opinions about that in the inner harbour. This also, in connection with the dredging of the Inner Harbour, is important. Altogether about one and a third million tons have been dredged from the floor of the harbour, and gossip to the contrary notwithstanding, the depths over the dredged areas have been well maintained. This part of the work is nearing completion.

THE RECLAMATION AND BOAT HARBOUR.

The original scheme for the Teluk Ayer Reclamation (the second, the former one being completed in 1894) was the construction of a sea wall from Johnston's Pier to Malay Point and the reclamation of this land, so that local ships up to eighteen feet might come alongside the wall and work their cargoes. In 1911, owing to the enormous depth of mud overlying the hard bottom, it was found impossible to complete the Telok Ayer Wall at any reasonable cost, and there was substituted for the full reclamation a Tidal Basin Scheme, which it is hoped to have completed by the end of next year.

The scheme provides for the omission of 900 feet of the originally designed wall, and the formation of a basin for small craft. This tidal basin will have an area of 22 acres, only slightly smaller than the Lagoon Dock at Tanjong Pagar, and will be dredged, say to seven feet at low water, permitting of the use of this area by

boat and tongkang traffic of the Singapore River type.

THE SEA WALLS

As has been said, the original scheme was a sea wall based on sunk concrete cylinders, dry land on the one side, sea on the other. But it was soon found that the concrete cylinders had to be sunk to an enormous depth before they entered the solid, and, where the old stream at Teluk Ayer debouched, no bottom was to be found at a practicable depth. The revised plan is, at the ends where the better foundation is, a double wall of cylinders tied together with steel rods and the intervening space filled in. There is thus the composite wall substituted for the single wall. Away from the shore ends an ingenious system of wall and superstructure takes its place. The wall is there, and on the inner face are two further rows of cylinders, between which and the wall reinforced concrete trusses support a superstructure 85 feet wide. If one could see it above ground it is a wall, with cloisters, both resting on concrete pillars. In the cloisters the sea water will flow freely from the inside. The original wall would have had the strain of 30 feet of earth on one side and eighteen feet of water on the other. The new wall has still the 18 feet outside, but inside there is twelve or thirteen feet of earth, and five or six of water.

The Northern Pier, 560 feet long on its inner face, is clearly seen from Johnston's Pier and Collyer Quay, and is practically finished. One has, however, to walk on the 85 feet wide Quay to thoroughly appreciate the magnitude of the work. Or better still, climb down and peer under the floor of the superstructure.

The Southern Pier is 1,360 feet in length and is almost complete as far as its cylinder foundations go, and the superstructure is now in hand.

The process of construction is exceedingly interesting, especially if one has, as our representative had, at hand, some one well acquainted with the work to explain the process of putting in the temporary structure to form the mould of the reinforced concrete, to tell how the steel bars and moulds are arranged, and the devices to overcome difficulties.

The ends of these two piers are finished. When the remainder is completed, the basin will be dredged out, and the inner walls probably stepped to facilitate boat and tongkang work. On the 66 acres of land—which will take all that remains of Mount Palmer to make—godowns should be erected, each with a line of rails connected with the railways on the sea walls, and with the Tanjong Pagar system.

Thus from ship to sea wall direct; or from ship to tongkang to be taken over the tidal basin to the godown steps; into the train and down to Tanjong Pagar for transshipment, or for rail carriage to the Peninsula! Compare this with the delays of the Singapore River traffic! And the tidal basin will furnish, on one side the 2,000 ft. of sea wall; on the other over 3,000 feet of stepped Quay—say as much as there is in Singapore River up to beyond Elgin Bridge. With no bridges or currents or bad tides to interrupt the work!

The Engineers of the works, Messrs. Coode, Matthews, Fitzmaurice and Wilson of London, are represented locally by their partner, Mr. Leigh Matthews, while Mr. R. M. Lewis is Resident Engineer.

The contractors, Sir John Jackson, Ltd, and their staff are to be congratulated on having so far "made good." An organisation and attention to detail which not many in Singapore realise has been devoted to the work, and Mr. Wilkinson, Mr. Axten and their colleagues have reason to be proud of the success that has followed on their efforts.

KING'S DOCK, SINGAPORE

On August 28 the Governor of the Straits Settlements, Sir Arthur Young, formally opened the new Graving Dock of the Singapore Harbour Boards, and named it King's Dock. From the *Singapore Free Press* we learn that in asking the Governor to open the Dock the Chairman of the Board, Mr. J.R. Nicholson, C.M.G., said *inter alia*:—"We may repeat the remarks of our predecessors by saying that in this dock we have provided a dock which is likely to meet the requirements of the port for many years to come, in fact, we can dock any ship afloat. The "Imperator" is a few feet longer but were she to honour us with a visit, we would express our welcome by spoiling the beautiful symmetry of the north end of the dock by removing a few feet of concrete and thereby give her a comfortable berth. There is only one dock in the world materially larger than this—that lately opened by His Majesty the King at Liverpool, the Gladstone Dock, but that is not purely and simply a graving dock: for the sake of economy it is constructed with cargo warehouses along one side, so that when not being used to dock vessels for repairs, the dock may be usefully employed in discharging cargo. I don't want this remark to be an egg which may hatch out in the fertile brain of some one into the idea "Why not use the dock to discharge coal, there is plenty of room?" So there is and I hope the time will not be far distant when there will be a large business in coal done with in close proximity to this dock, but not by means of the dock. To give you some idea of the size of this dock; its construction has taken four years and a half and cost \$3,696,679; it contains 121,000 cubic yards concrete or practically 200,000 tons, the amount of cement used was 21,000 tons, a figure which perhaps does not convey to you so definite a meaning as say barrels: if all the barrels used were placed end on they would reach 51 miles. The dock contains 22½ million gallons of water when full and is emptied by two large centrifugal pumps each driven by a surface compound engine, each engine developing 1,000 H.P. The draining pumps are electrically driven. The pumping power is capable of emptying the dock in two hours which gives the quantity of water being pumped as 187,500 gallons per minute or 836 tons per minute. On behalf of the Board and Engineers I should like to express our appreciation of the magnificent work Messrs Topham Jones and Railton have given us, and also to convey to Mr. Taylor, the local director of Messrs. Topham Jones and Railton, our indebtedness to him for the courteous and fair minded way he has invariably displayed throughout the conduct of this work."

DESCRIPTION OF THE DOCK

The King's Dock which has just been completed in Singapore for the Singapore Harbour Board at a cost of over £400,000 is the largest dry dock in the Far East and will add very materially to the facilities of the Board for docking work.

The dock is 879 feet in length by 128 feet in breadth, with an entrance width of 100 feet; it can, however, be divided by a central caisson into an inner and outer portion which can then dock ships of 502 feet and 346 feet in length respectively. The depth over the outer sill is 34 feet at high water spring tides and 24 at extreme low water; the inner sill is dropped lower so as to admit of sufficient working space under the bottom of any ship which may be long enough to reach over the central division.

The dock is constructed entirely of concrete, with the exception of the two entrances which

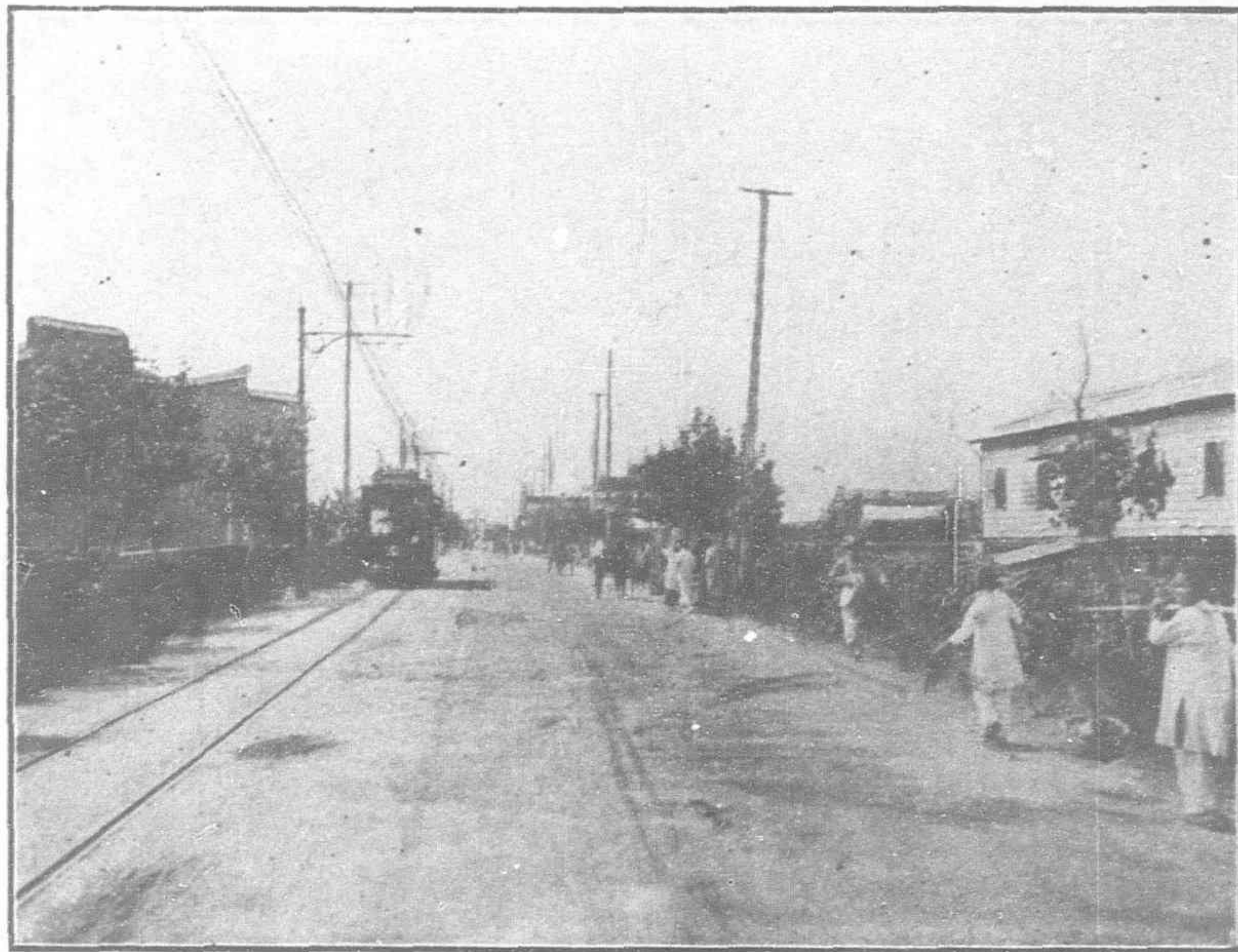
(Continued on page 128)

THE NANTAO (SHANGHAI) TRAMWAY

THE FIRST CHINESE TRAMWAY IN CHINA



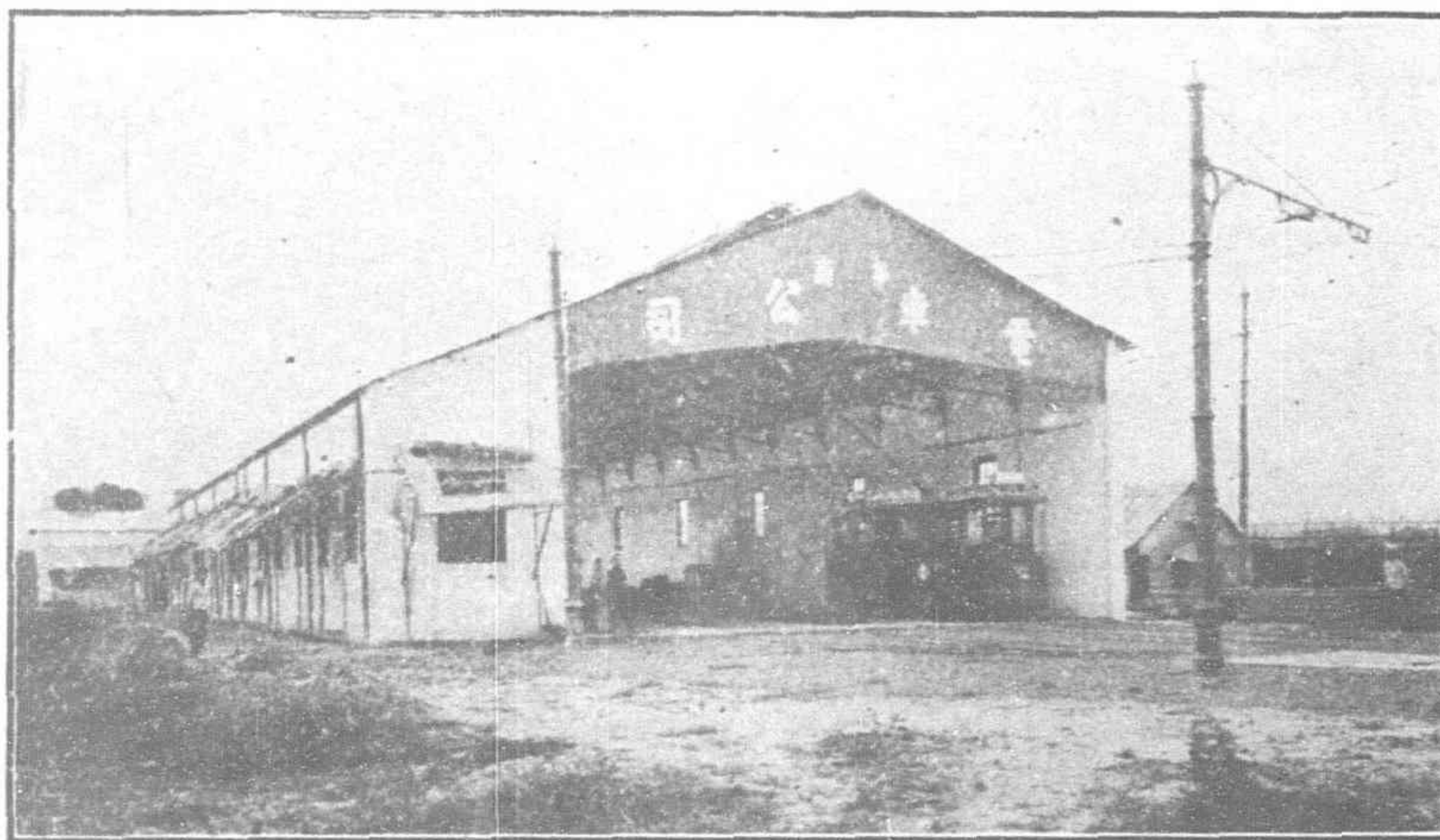
NANTAO TRAMWAY.—Mr. Lo Pah-hong, who formed the Nantao Tramway Company



NANTAO TRAMWAY.—Near the Shanghai-Hangchow Railway Station

On August 11 last the Nantao Tramway Company formally began its service. The occasion is particularly noteworthy, inasmuch as this is the first tramway in China which has been financed, built and managed by Chinese. The only foreign assistance was that given by Mr. E. Kocher of Messrs. Siemens China Electrical Engineering Company, who supervised the work and retains the position of consulting engineer to the Company. Apart from Mr. Kocher the enterprise has been entirely carried through by the Chinese themselves.

The Nantao Tramway Company was formed in April, 1912, mainly as a consequence of the efforts of Mr. Lo Pah-hong, who was the prime mover in the whole affair. Mr. Lo Pah-hong obtained the consent of the authorities and succeeded in interesting several of the rich Chinese residing in Nantao. As a result the Nantao Tramway

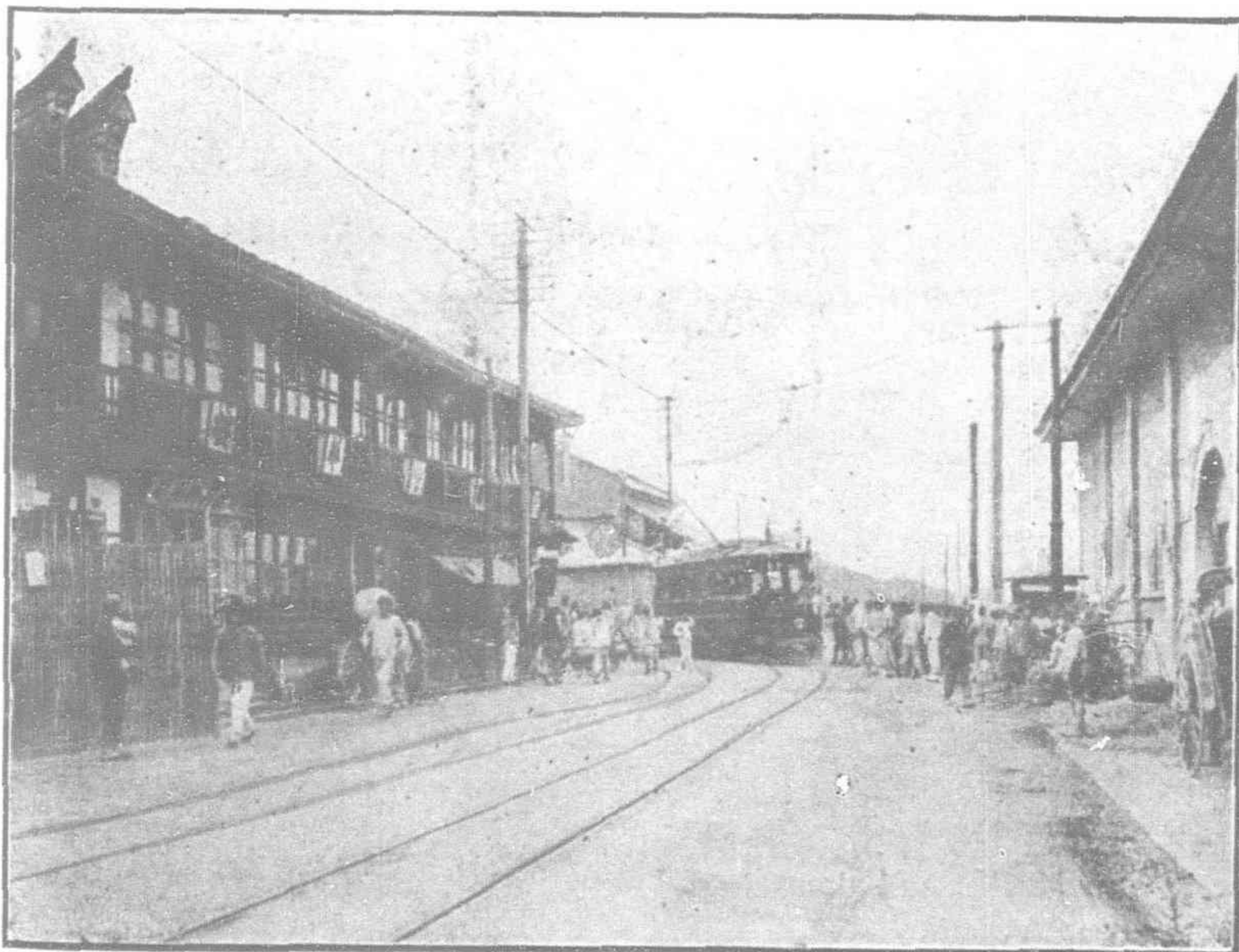


NANTAO TRAMWAY.—The Carshed

Company was formed with a capital of about Tls. 200,000.

The line starts from the Marché de l'Est (in Chinese Chilopu) and runs along the Chinese Bund to the south end of the Bund. From the Marché de l'Est to Tungkadoo there is a double track. From Tungkadoo to the Shanghai-Hangchow Railway Station—the present terminus of the line—there is a single track with loops every 400 metres. The length of the line between Marché de l'Est and the Shanghai-Hangchow Railway Station is about 2½ miles, and the proposed extension to the Arsenal is about three quarters of a mile. There are about 32 curves in the whole line, and the rails were sent out from Germany bent into the shape required.

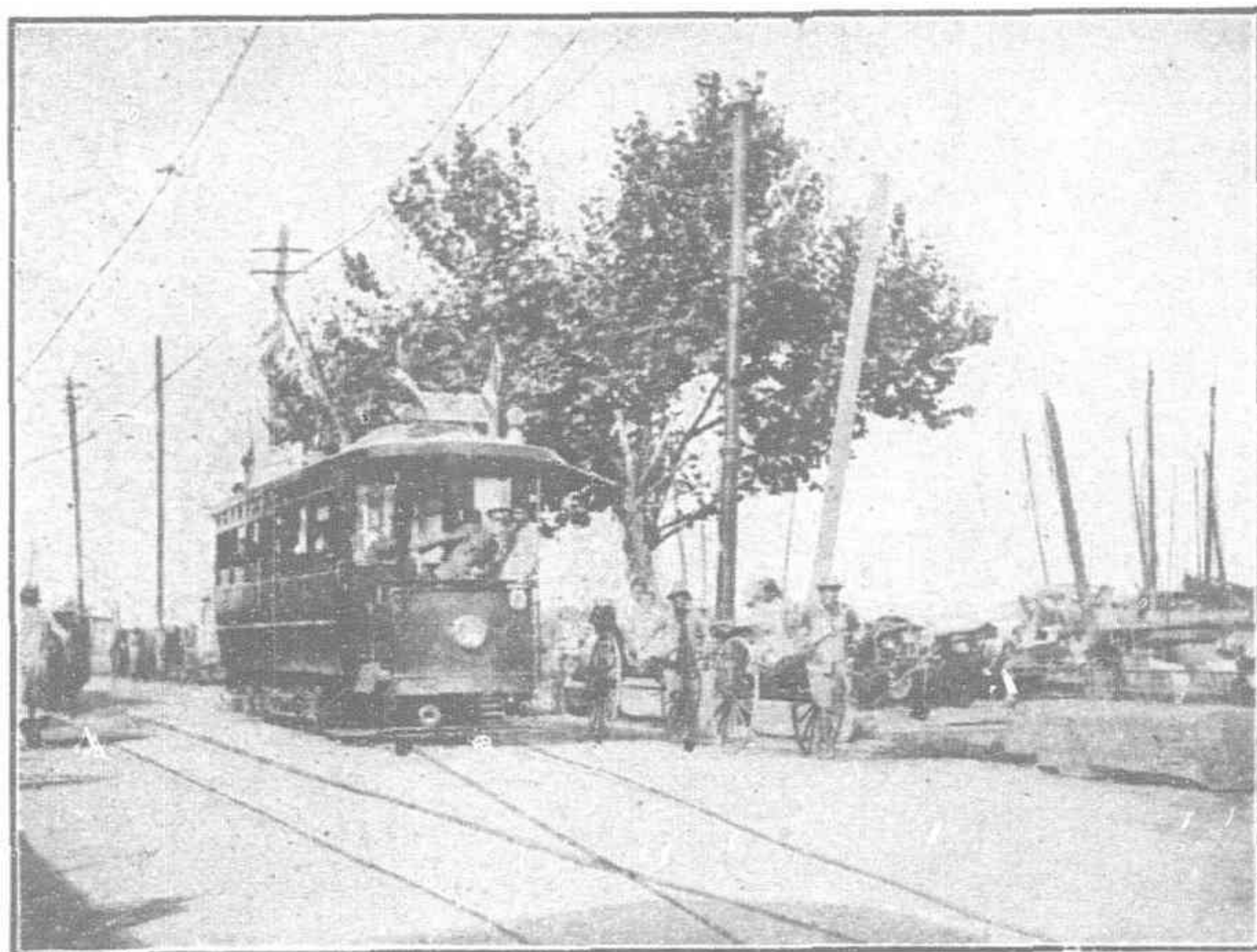
The material, rails, cars, etc., were ordered in May last year, but the rails did not arrive until March



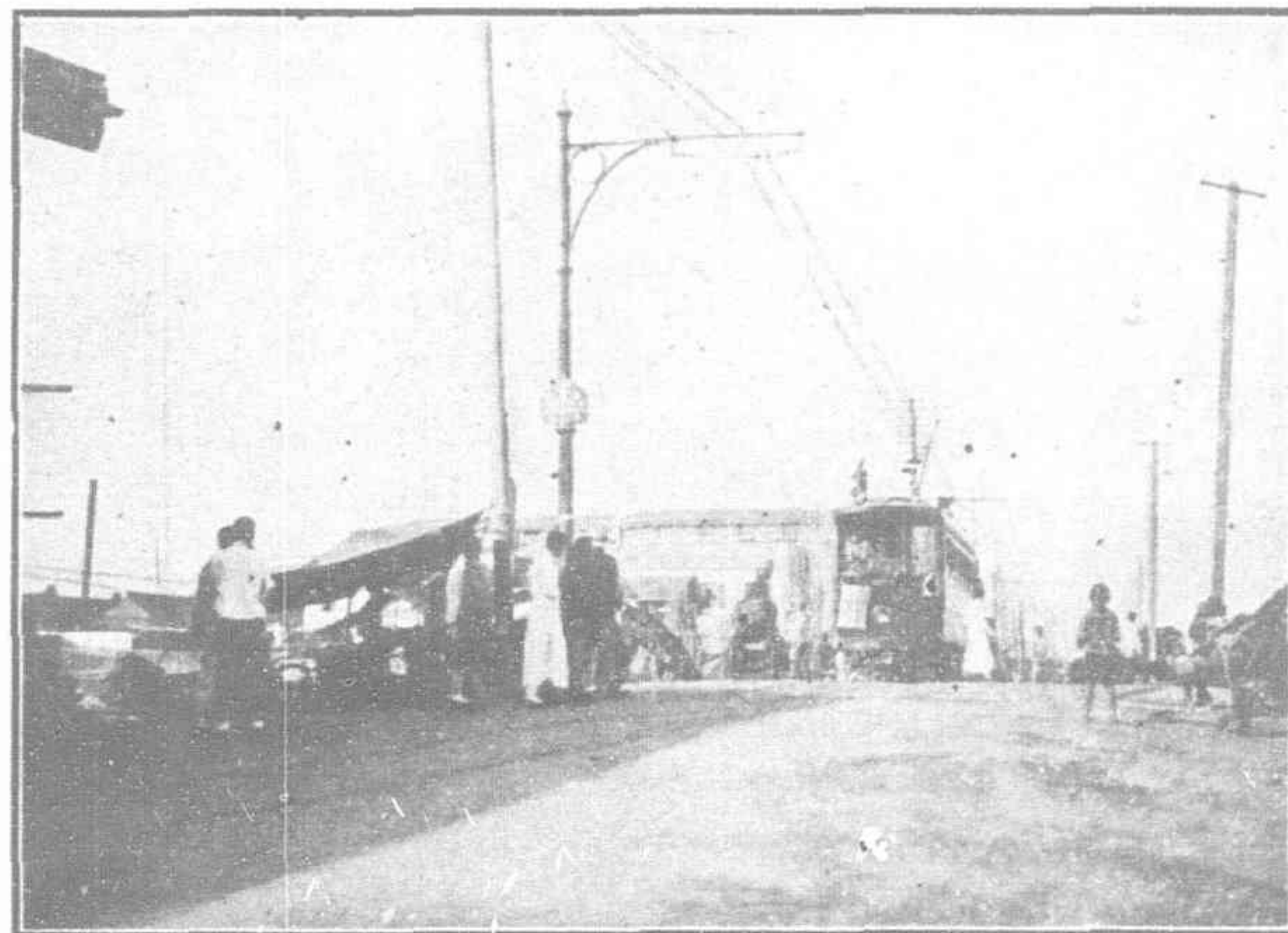
NANTAO TRAMWAY.—Terminus Marché de l'Est



NANTAO TRAMWAY.—Mr. H. Kocher, under whose supervision the line was built



NANTAO TRAMWAY.—The Chinese Bund



NANTAO TRAMWAY.—Bridge near south end of the Chinese Bund

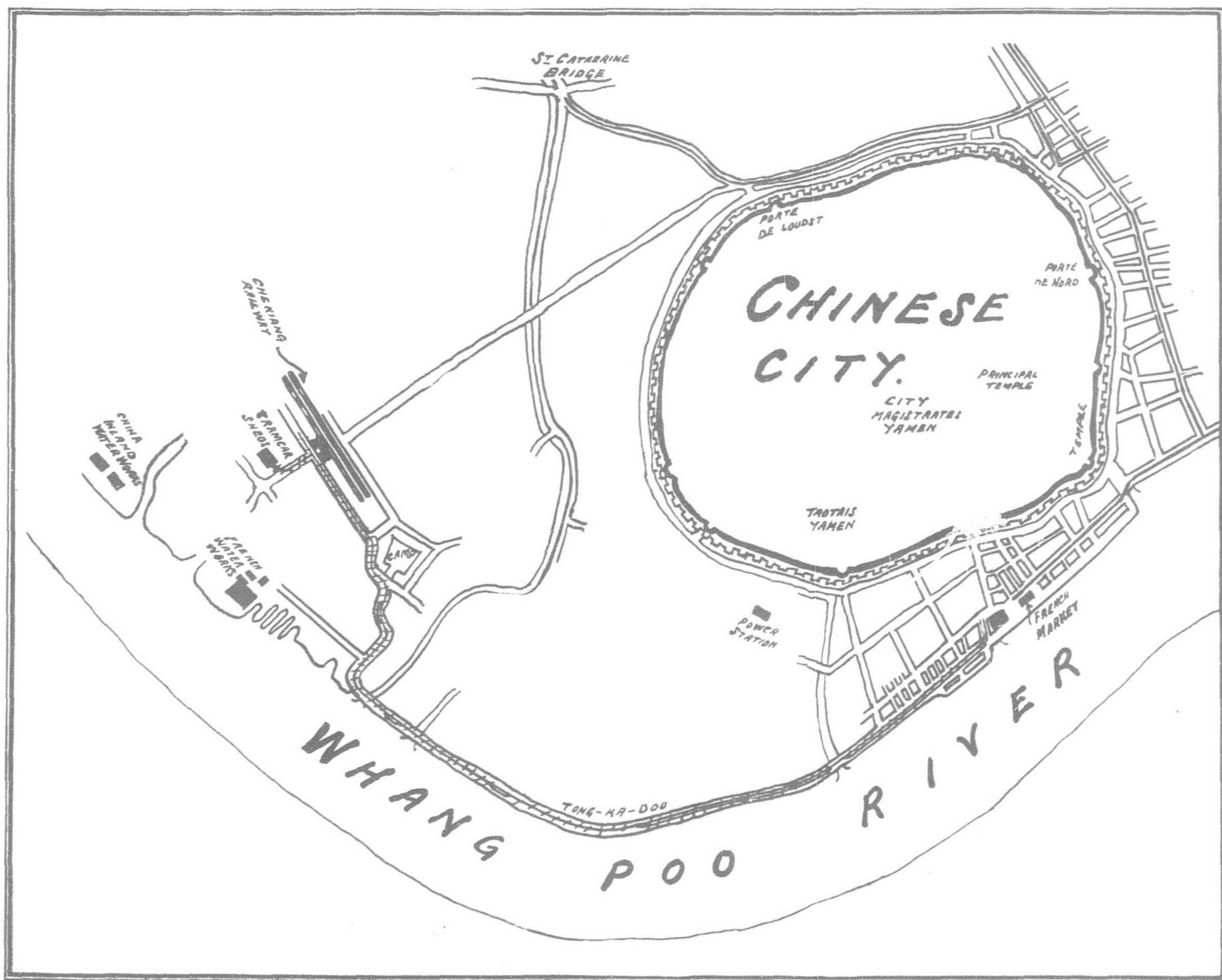
this year. The delay was occasioned by a fire breaking out on the steamer conveying the rails, while in the Mediterranean, and as a result the vessel was compelled to return to Hamburg. Owing to the delay thus caused the work could not be started until March, but it was finished by the end of June. It may be mentioned that the line had to be surveyed by Mr. Kocher before the order for the rails could be sent, and this work occupied some weeks.

A trial run was made at the beginning of July, but the outbreak of rebellion, attended by protracted hostilities in the locality traversed by the line, prevented the formal opening of the service. The car shed, it may be mentioned, was damaged during the fighting.

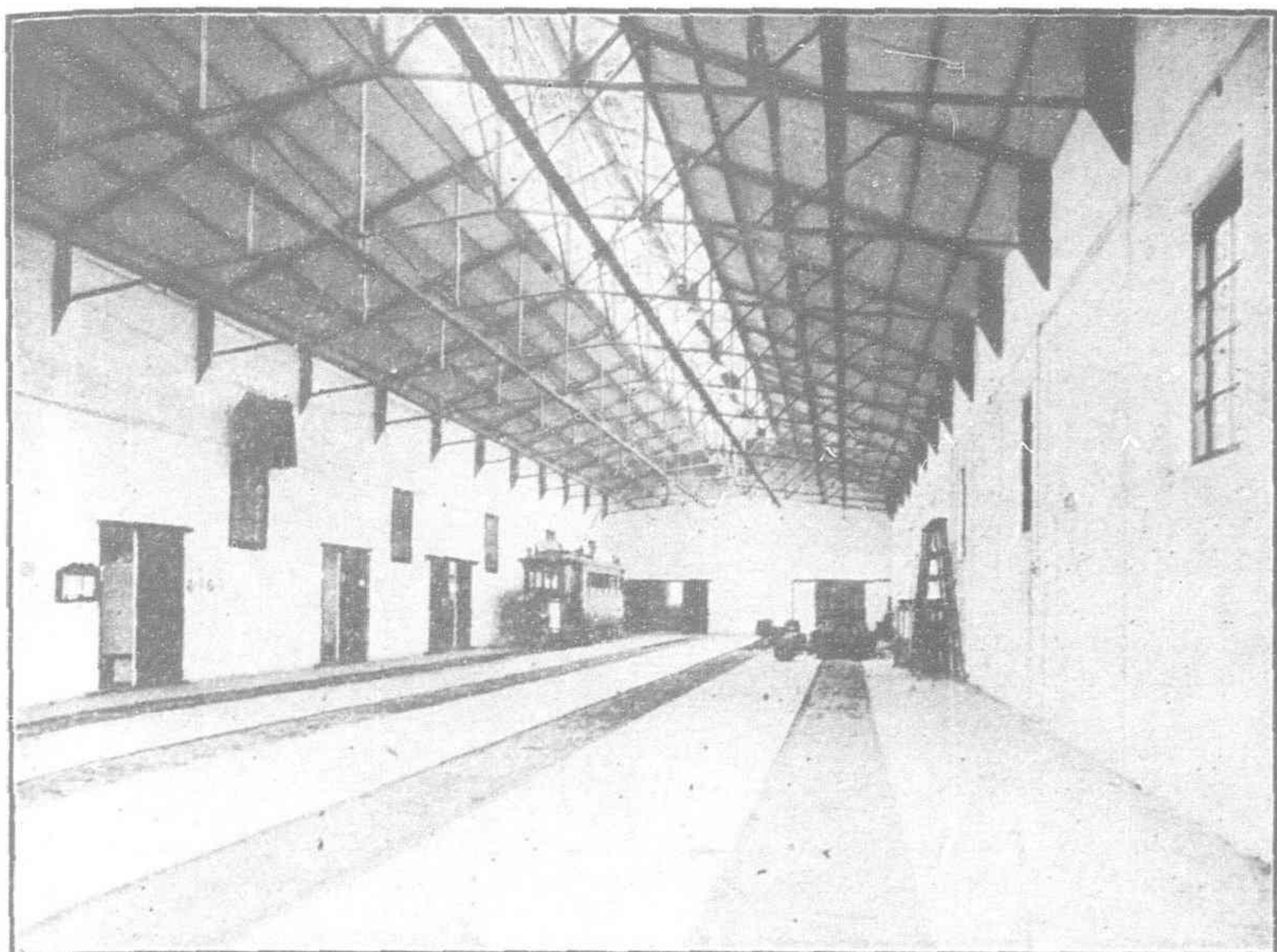
However, by August 11 conditions around Shanghai had improved to such an extent that the Company felt justified in formally starting the regular service.

THE RAILS.

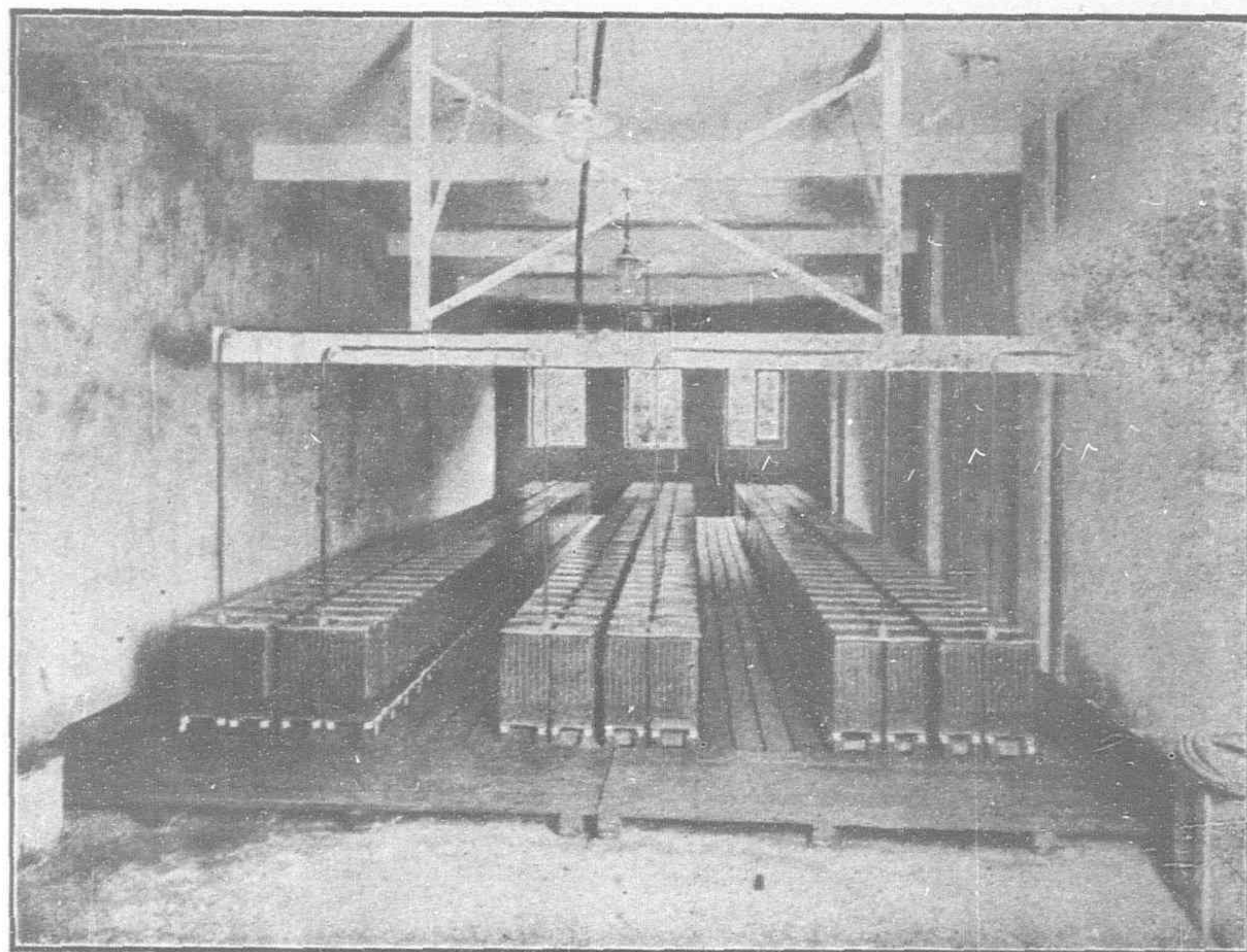
The rails were imported from Germany and were supplied by the Gutehoffnungshütte. They are fairly heavy rails of about 100 kilos per metre. The foundation for the rails was formed by digging a trench 500 m/m by 300 m/m, placing in the bottom large stones with pyramid points upwards, and over this placing smaller stones and gravel, well stamped down. This method of forming the foundation for



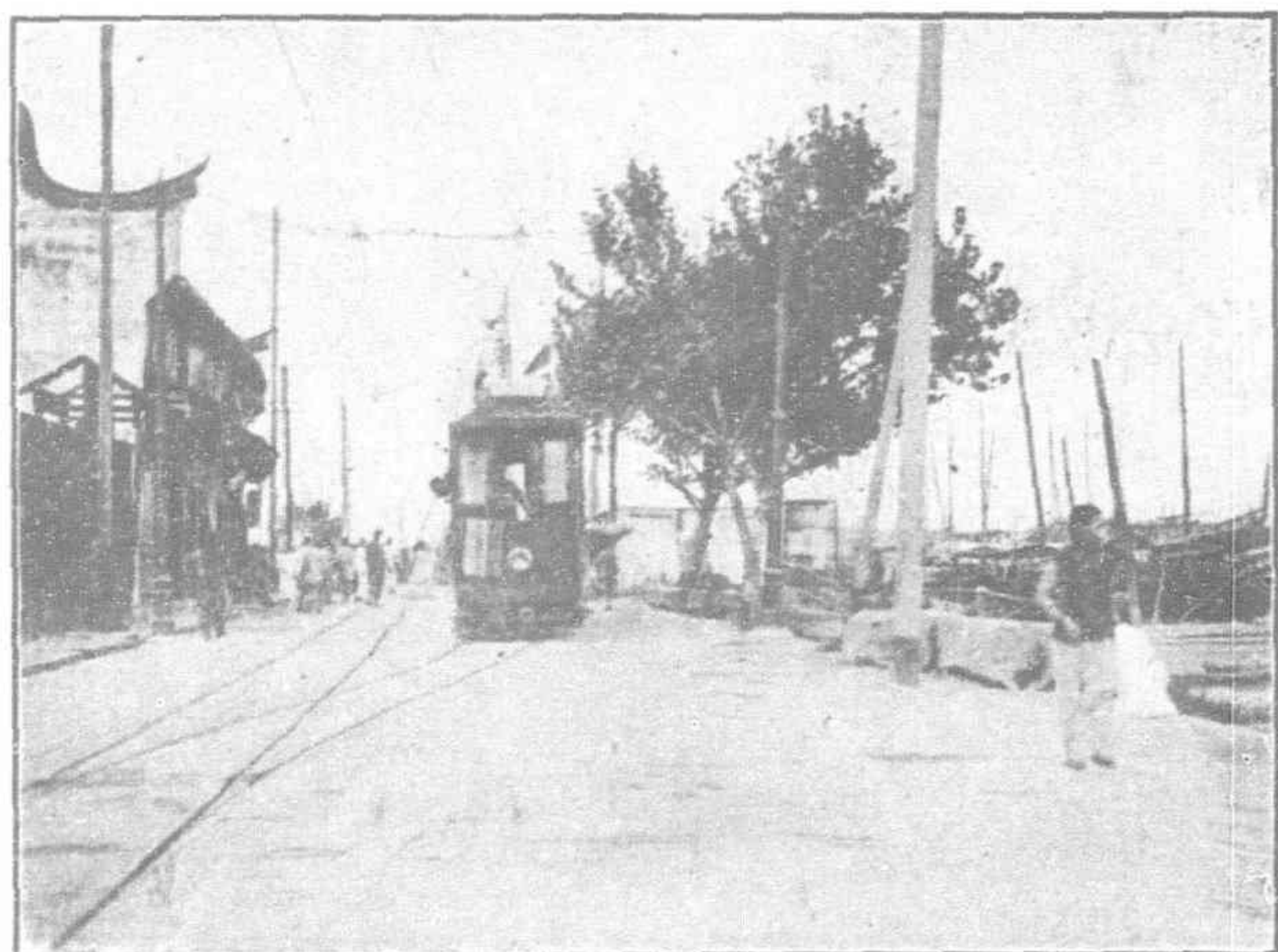
Map showing the Nantao Tramway Line. It begins opposite the French Market and along the Bund to the Sheds opposite the Shanghai-Hangchow Railway Terminus



NANTAO TRAMWAY.—Interior View of Carshed



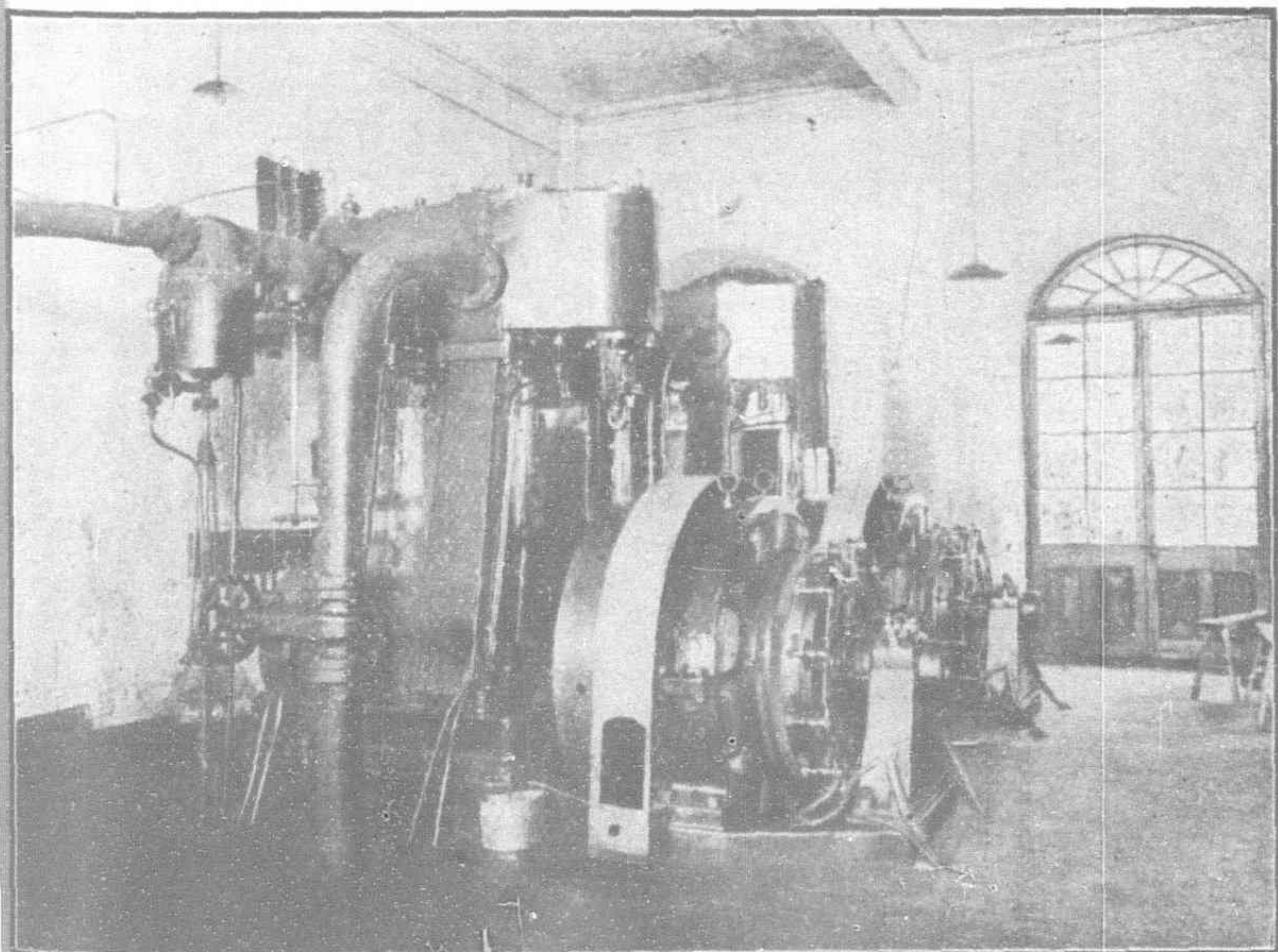
NANTAO TRAMWAY.—Accumulator Battery



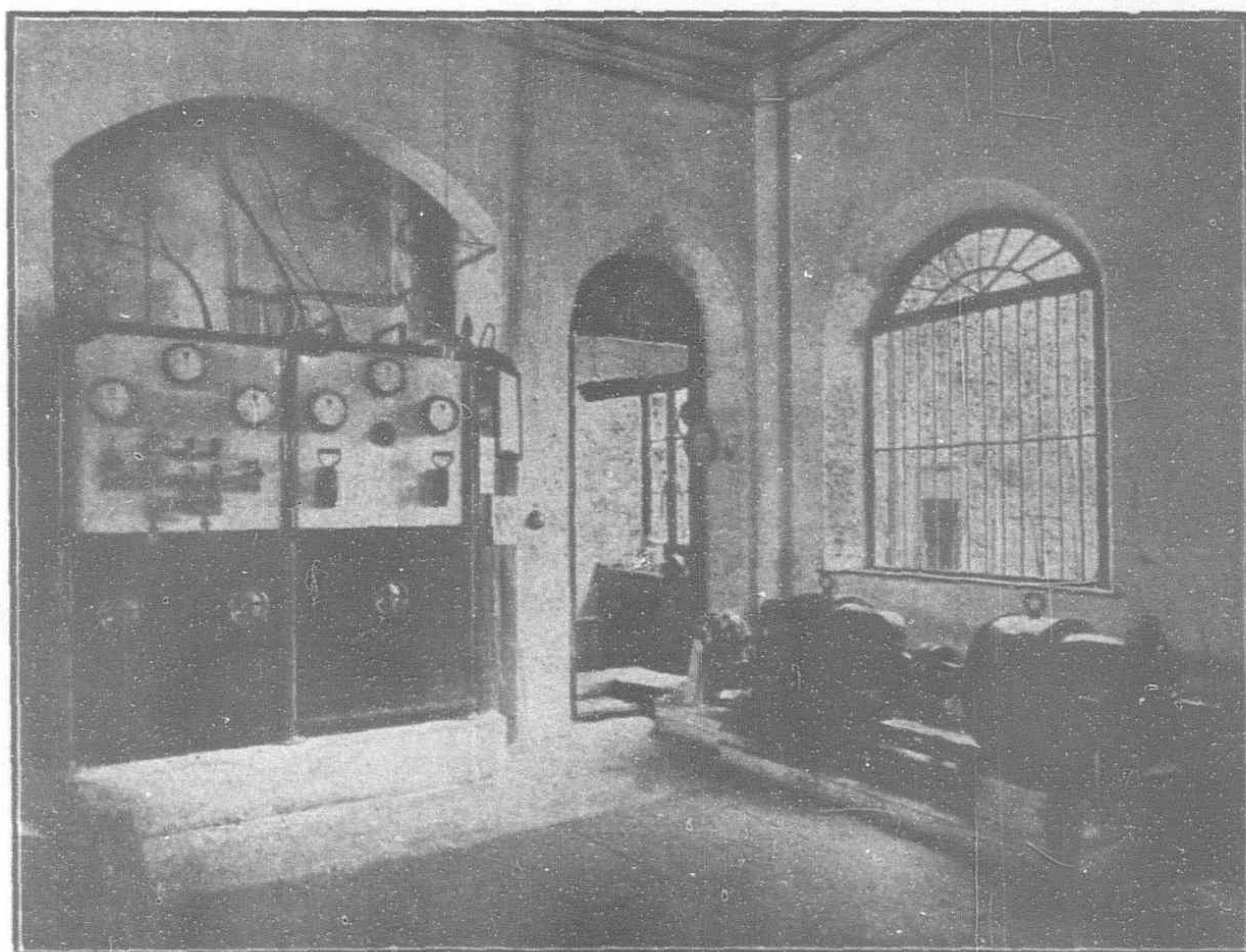
NANTAO TRAMWAY.—Loop at Tongkadoo



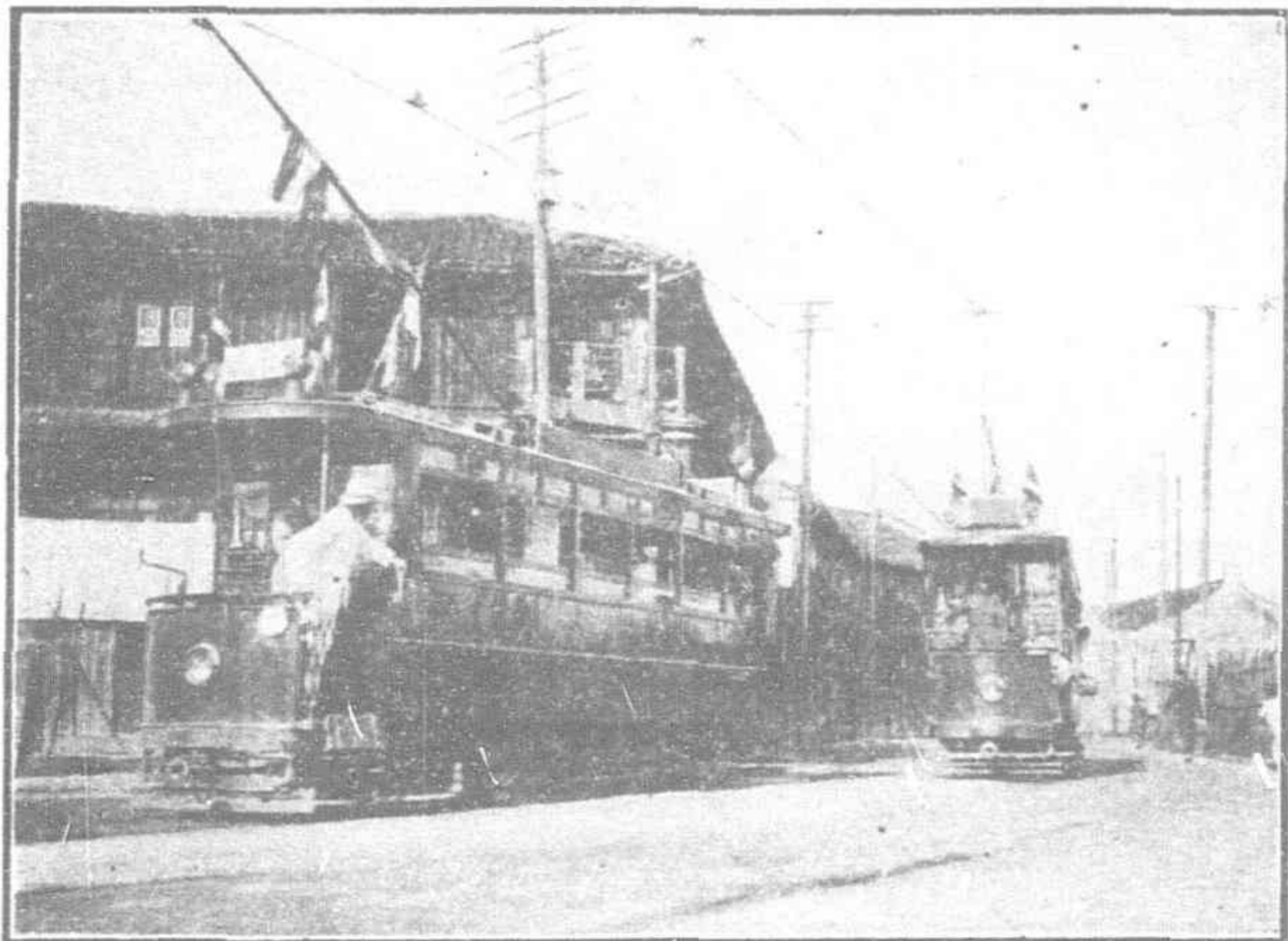
NANTAO TRAMWAY.—Street near the Marché de l'Est



NANTAO TRAMWAY.—Steam Engines and Dynamos



NANTAO TRAMWAY.—Booster and Switchboard



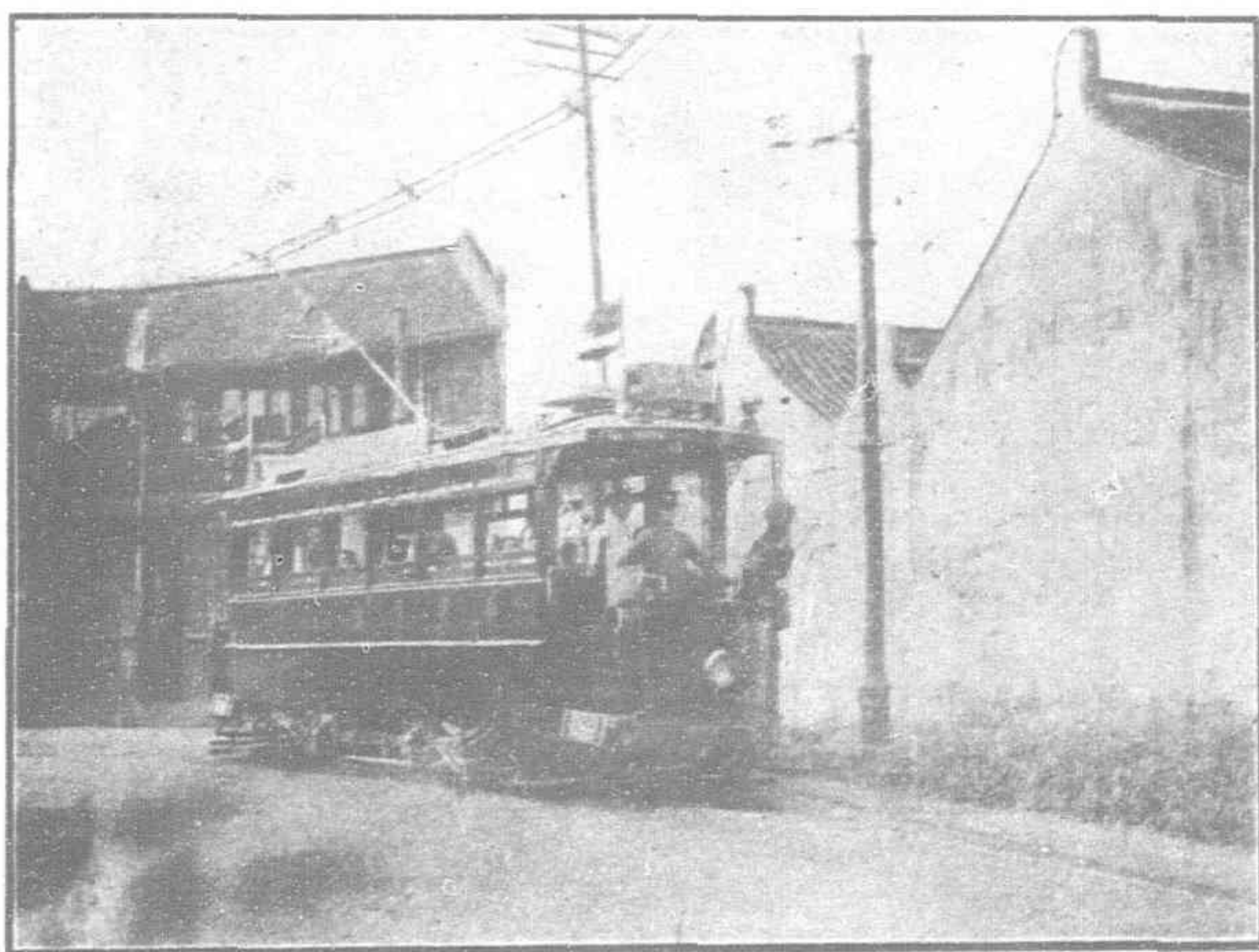
NANTAO TRAMWAY.—Another Loop

the rails enables surface water to drain away, while providing for stability and rigidity. Each rail-joint is placed on a plate of reinforced concrete. The switches are made with two tongues as on railway tracks, a provision which lessens the shock to the passenger. Although the track was laid as before mentioned, to the Shanghai-Hangchow Railway Station, already an extension to the Arsenal has been ordered, and the work on this part of the tramway will be started in a few months.

THE TROLLEY WIRES.

For the overhead line there were employed two trolley wires of hard drawn copper of a cross section of about 55 square millimetres.

The trolley wire is supported by insulators suspended to steel wires, which are fastened, on the double track portion, to steel poles, and on the single track part are attached to brackets. About 900 metres from the Marché de l'Est the feeders are connected with the overhead wire going from the Power House, which is situated near the city wall. All the parts for the overhead line as well as for the



NANTAO TRAMWAY.—Turnout near Military Camp

car trucks came from Siemen's Bros. Dynamo Works in England.

THE CARS

The trucks for the cars were furnished by the United Electric Car Co., Ltd., of Preston, England. They are similar in character to those used in the trams in the Settlements. The motors, controllers and all the electrical equipment for the cars were furnished by Siemen's Bros. Dynamo Works.

The motors are designed for a maximum speed of 20 kilometres an hour (about 12 miles an hour), but the average speed will not be more than sufficient to cover the whole distance between the Marché de l'Est and the Shanghai-Hangchow Railway Station in twenty minutes.

There are first and second class cars, as is the case with the French Tramway Company in the French Concession, and the car bodies are about the same. These were made locally by the Yur Sing Factory (Nicholas Tsu).

THROUGH RUNNING.

With an eye to the future, the gauge and the height of the trolley wire were made similar to what has been adopted in the French Concession and the International Settlement. This will render it easy, when the time comes, to organise a through service. As a matter of fact, arrangements have already been made with the French Tramway Company to link up the systems at the bridge across Fong Pang Creek.

CAR SHED.

The car shed, which has been constructed to afford accommodation to twenty cars, is situated in front of the Shanghai-Hangchow Railway Station. It contains also an office for the traffic manager's department, repair shops, painting shops, store rooms, etc. There is now in course of construction a large office for the

managerial and clerical staffs, near the shed. The ground for the car shed is sufficiently large for the construction of another shed of similar size and a number of other buildings. The car shed is a steel building, and was built by the Yur Sing Factory. The building was designed to give every facility for the efficient maintenance of the cars and is up-to-date in every particular.

THE POWER HOUSE.

The power is supplied by the old Power Station of the Shanghai Inland Electric Light Company. It contains two engines of 100 kilowatts each, which served up to 1910 for the lighting service of this Company. In that year they were taken out of service because a new station near the Arsenal was opened. The engines were overhauled and fitted for the tramway work by adding a storage accumulator battery and booster of the Pirani-Siemens-Schükert system. The battery and the booster prevent the fluctuations of the current taken up by the cars, from influencing the dynamos and steam engines and besides that, the battery can keep the cars going for some time, in case of a breakdown of the steam engine or dynamo.

The dynamos supply a voltage of 550 volts to the trolley wire, and each engine is capable of driving from 18 to 20 tram cars on the speed at which they are run at present.

THE TRAFFIC.

The traffic on the line already largely exceeds the estimates that were made originally, and the cars, especially the second class, are always crowded with passengers. The Company is already considering the advisability of augmenting its material. Moreover a proposal to

run a new line round the city along the boulevard which has replaced the old wall, is engaging attention and this work will probably soon be put in hand.

Considering that the Chinese workmen and foremen were not accustomed to that kind of work and that, during the laying of the rails, there were many days of bad weather, it must be said, that the work was carried through in a very short time. This is highly creditable to the Chinese staff.

It is an interesting fact that, in spite of the heavy traffic on the Chinese Bund, up to now, that is in the first month of service, not a single accident has occurred, much to the pleasure of the Chinese authorities and managers, some of whom were afraid that there would be accidents, especially during the early days.

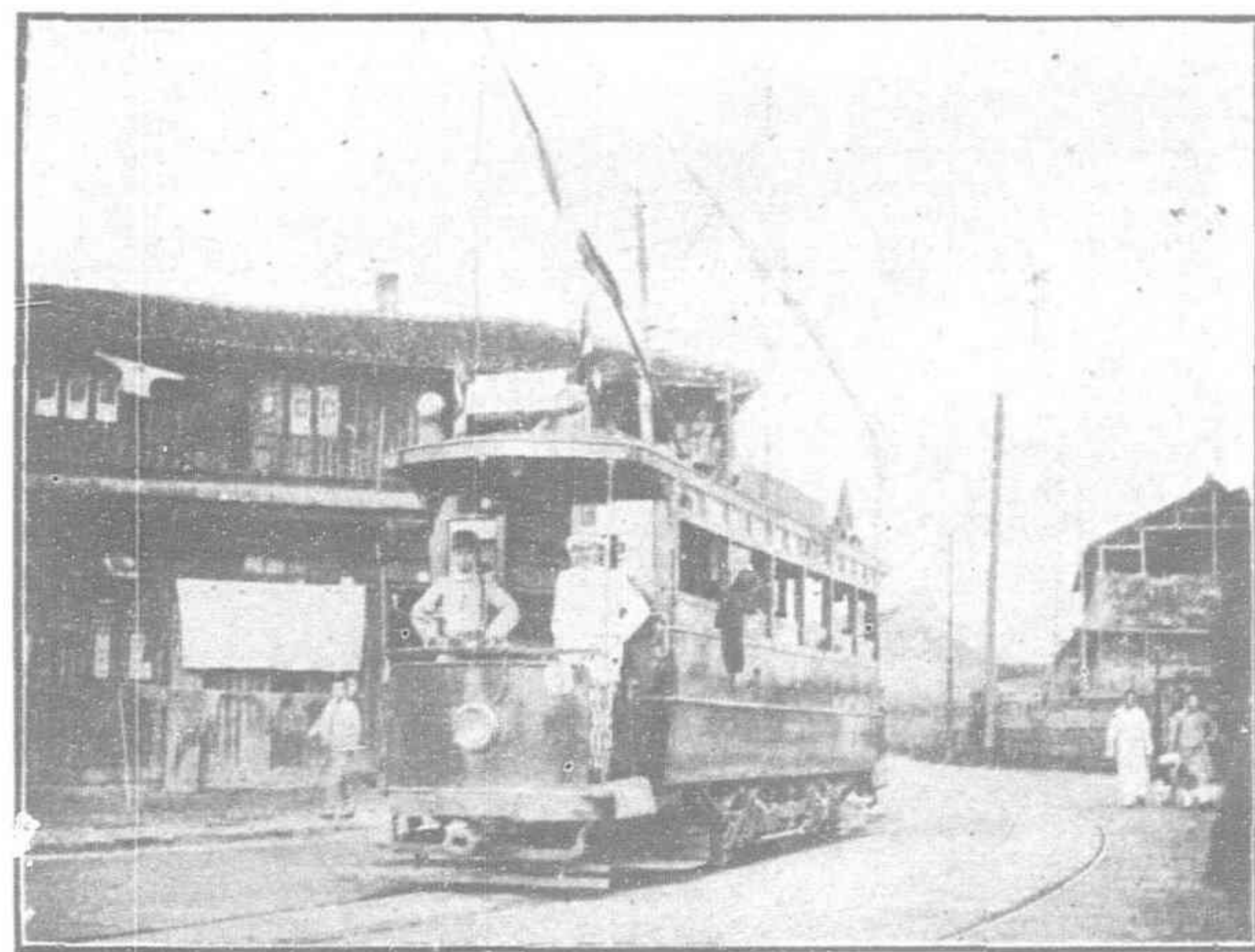
KING'S DOCK, SINGAPORE

(Continued from page 124)

are of Cornish granite ashlar. The altars throughout the work are of moulded concrete blocks, the remainder of the facework is worked up with fine concrete masswork. Three rows of granite keel block courses also run throughout the dock under a corresponding number of heavy timber keel blocks, the remainder of the floor is of mass concrete.

Two ships' caissons, built by the Thames Ironworks Company are provided; they are identical in size and are accordingly interchangeable; each weighs 826 tons including ballast.

The dock is filled through two culverts 7 feet high by 4 feet 6 ins. wide and is emptied through two culverts 10 feet by 6 feet leading to the pumping station, where two of Messrs. Gwynnes 60 inch centrifugal pumps are installed. Each of these pumps has two suction 36 inches in diameter, and is direct coupled to a compound condensing engine of about 1,100



NANTAO TRAMWAY.—A "Turn-out"

I.H.P. with cylinders 24 inch and 46 inch diameter by 24 inches stroke. Steam is supplied to the pumps at 160 lbs pressure by three Babcock and Wilcox boilers each capable of evaporating 12,300 lbs of water per hour.

These pumps are capable of emptying the dock, which contains 22 million gallons of water, in less than 2 hours against a maximum lift of 39 feet.

The dock equipment comprises four 10 ton and eight 5 ton capstans by Messrs. Clark Chapman and Co., a 5 ton crane by Messrs. Babcock and Wilcox, a 15 ton crane by Messrs. Stothert and Pitt and penstocks by Messrs. Glenfield and Kennedy; all of which appliances are operated electrically by power derived from the Board's own power station.

The Engineers for the works are Messrs. Coode, Matthews, Fitzmaurice and Wilson and Mr. J. R. Nicholson, C.M.C., Mr. F. C. Fforde acting as Resident Engineer. The works were carried out under contract by Messrs. Topham Jones and Railton, Ltd., Westminster.



NANTAO TRAMWAY.—Another View on the Chinese Bund

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STARVING CHINA'S RAILWAYS

The optimists in China in 1911-12 had some excuse for believing that the change of government consequent upon the overthrow of the Manchu régime would mean a change for the general betterment of the country—a change which would signalize remarkable industrial development, and which would give a long awaited and sorely needed fillip to railway expansion. For some reason or other it was generally believed by foreigners that reform in this direction would be spontaneous and immediate. It has not been. So far even the Government has not assumed definite shape. Politics have played so important a part with the various Boards that progress has been compelled to take a back seat, and declarations of the leaders of the new order that China would forthwith leap into a bold forward movement; would clamor for and welcome foreign assistance and advice; and would widen the avenues for foreign trade and intercourse, have been given the lie almost before the echoes have had time to die down in the distance. This may or may not be intentional. We will join the charitable in attributing the shelving of the good intentions to the desire of patriots for the prior establishment of a good central government, but in doing that we are, to a certain extent, compelled to stand with the jeremiahs and wonder when that desideratum is ever likely to materialise if party feelings and prejudices are much longer to be permitted the pernicious play that has been so far vouchsafed them. Both the Government and the opposition parties are to blame for the deplorable stultification of post-revolution promises and the unhappy conversion of enthusiastic optimists into the most plaintive of pessimists.

The well-wishers of China were particularly optimistic about the future of railways. They felt that they had grounds for legitimate belief that the Government under President Yuan Shih-kai would insist upon a strong forward policy being adopted and followed, but the President has had other things to attend to than the welfare of existing railways, and the Board of Communications has not yet managed to pull itself together to face expenditure for adequate maintenance of lines in operation and the replenishment of depleted equipment, much less the making of a display of enterprise in other directions. The Board has in fact been the milch cow of all other Boards. It is the one earning department in the governmental scheme of things, and the proceeds which do come to its coffers from the various railways are not permitted to remain out of circulation for any length of time. They are quickly requisitioned for general administrative purposes, with the result that the Board is deprived of all chance of benefiting

the lines out of earnings, as should be done, and is provided with an excuse behind which to hide from the clamors of those who are constantly crying for more rolling stock to deal with the transport of the increasing quantity of cargo that is being offered. Every line in operation in China is underequipped, and the lack of transportation facilities is causing a serious loss to the revenues of the State. On the short line from the Kailan mines an augmentation of traffic by some two thousand tons a day could be made if there were sufficient wagons to carry the coal. On the Peking-Mukden line, on the Tientsin-Pukow line, on the Shanghai-Nanking line, on the Peking-Hankow line, and on others, there is a constant cry for more and more cars, carriages, and locomotives, and ever the cries fall upon deaf ears. The voices are as those which rise unheard in the wilderness. The Tongshan works is making as big an effort as possible to supply some new cars, but that will meet but a limited need. What is required is the quick importation of a quantity of up-to-date equipment, and that should be arranged for by the Board of Communications immediately and without waiting for current earnings to be available to defray the expense. The development of the dormant trade will in itself pay for the additional means to secure the profits. That is a thing which the authorities in the Board do not seem to realise.

No better illustration of the increase in the value of railroads can be given than those of America and Australia, where virgin country is opened up for settlement. In China all available land is under the plough. No matter in which direction the traveller might pursue his way, nor for what distance, he will begin his days and end them in cultivated areas. The crops and the settlers are always awaiting the railway, and in this peculiar respect China is infinitely better off than those countries which have to depend upon the railway to open up settlements. Despite that, the Chinese hesitate thoroughly to equip the railways they have for the services they are designed to render. As an inspiration those responsible for reluctance in responding to the requests of the various railway managements for increased rolling stock should study the trend of railway affairs in the state of New South Wales. There is a country possessing not a tithe of the population which China boasts. In fact New South Wales claims something about 1,700,000 peoples only, as against China's 400,000,000, or against the least populated province, distant Kansu, which has 5,000,000 inhabitants. Yet what is the record of New South Wales in railways? During the six years ended June, 1907, the total number of passengers carried was 211,000,000. In the six years ended June, 1913, the total was 363,600,000, an increase of 152,000,000, or 72

per cent. The tonnage of goods and live stock in the first period was 16,000,000 tons, during the second period 24,000,000, an increase of 50 per cent. These figures, put into money, showed increases as follow:—Passenger earnings (Mexican currency), \$90,000,000 to \$140,500,000, an increase of 58 per cent. notwithstanding a considerable rise in fares; goods and live stock, \$120,000,000 to \$170,500,000, an increase of 45 per cent. The total earnings on all classes of goods was from \$230,000,000 to \$340,700,000, an increase of 50 per cent. During the whole six years in nearly every department there had been continuous expansion, but efforts were as continually made to meet it. On June 30, 1907, the number of locomotives was 656; in 1913 it had increased to 998, an advance of 52 per cent., not counting duplicate stock. That increase, however, does not indicate the true position, since additions had been made to the power of the engines. The total tractive power in 1907 was 13,000,000 lbs.; in 1913 it was 21,500,000 lbs., an increase of 65 per cent. The tractive power per engine had gone up from nearly 20,000 lbs. to over 21,000 lbs., an increase of 9 per cent. In the same period vehicles showed an increase from 12,700 to 19,000, or 51 per cent. The carrying capacity had increased from 111,452 tons to 213,311 tons, an increase of 91 per cent. The total expenditure in 1913 in connection with rolling stock alone, was \$9,070,000. These figures show what can be done with a small population such as New South Wales possesses and which, it must be mentioned, is mostly concentrated in large cities. What then can be done in China with its vast industrious agricultural population already established on productive land? Give China the railways, and give the railways adequate rolling stock, and the state revenues would rise by leaps and bounds. Keep the railways starved, as they are at present, and the result cannot be otherwise than disappointing to those who know how to manage railways and who can see the vast losses being suffered by China simply on account of lack of appreciation of the value of the great transportation service which might easily be developed. There is surely call for decided activity on the part of the Board, and now that a new Cabinet has been created the least that can be expected is that the sweep of the new broom will be felt in those places where it is needed.

THE TIBETAN CONFERENCE

On September 12 the Chinese Commissioner for the settlement of the Tibetan question, Mr. Ivan Chen, left Shanghai for Simla to take part in a conference in which representatives of the British and Indian Governments and of Tibet will participate. The conference, which will meet in October, will be attended by Mr. Ivan Chen on behalf of China; Sir Henry McMahon (Indian

Frontier Secretary); Mr. Bell (I. C. S.) and Mr. A. Rose (Foreign Office) and Longchen Shatra (Tibetan Prime Minister).

The importance of this conference will be readily recognised. The question of China's suzerainty over Tibet will, it is to be expected, be settled once and for all. In the Anglo-Chinese Convention of 1906 that suzerainty was practically admitted and Great Britain engaged not to annex Tibetan territory nor to interfere in the administration of Tibet. The following year Great Britain and Russia signed an "arrangement" which specifically recognised the suzerain rights of China in Tibet. The signatory Powers engaged to respect the territorial integrity of Tibet and to abstain from all interference in its internal administration. These two instruments restored international recognition of China's suzerainty, which had been ignored when direct relations were established between Great Britain and Tibet in 1904, when the Younghusband Convention was signed.

China, however, is apparently not content with the acknowledgment of her suzerainty, but wishes to establish her sovereignty. When the Revolution broke out in 1911 the Warden of the Marches, Chao Erh-sen, had practically restored China's authority and prestige in Tibet. The revolution in China was attended by a revolt in Tibet, and the Tibetans succeeded in expelling the Chinese Amban and his guards from Lhasa. Desultory fighting has been carried on in the Marches for the past two years, but the Chinese have not succeeded in making much headway.

The Republican Government can hardly be congratulated upon its diplomatic management of the Tibetan Question. A British Note was presented to China on August 17, 1912, by Sir John Jordan, H. B. M. Minister at Peking. This was a protest against the assumption of all administrative power in Tibet by the Chinese officials in that country, and demanded that an agreement should be concluded defining and restricting the powers of China in Tibet. The conclusion of such an agreement was a condition precedent to Great Britain's recognition of the Republic of China. No reply was made by China to this Note until December 23, 1912, when it was claimed that China had kept within her treaty rights and that there was no need to negotiate a new Treaty on the subject. The text of this correspondence was published in the FAR EASTERN REVIEW of January, 1913.

It became evident that satisfactory results could hardly be expected from negotiations in Peking, and proposals were made for a conference either in London or in Simla. Eventually it was decided to hold a tripartite conference at Simla, and Mr. Ivan Chen and Mr. Hu Han-ming, ex-Tutuh of Kwangtung, were appointed Commissioners for China. Political developments rendered it im-

possible for Mr. Hu Han-ming to accept the post, and Mr. Ivan Chen is now the sole Commissioner. To the difficult and not improbably thankless task before him he takes many of the qualities which would ensure success if success were possible. He may be depended upon to do much towards rendering possible a lasting adjustment of this, one of the most important of the external problems confronting the Republic of China.

CHINA'S FOREIGN ADVISERS.

China has so far managed to accumulate a presentable selection of foreign advisers. Men representing several countries have been engaged, and are drawing handsome salaries, but in return therefor are permitted to do little or nothing to bestow upon the nation the benefits of their learning or experience. Their efforts are apparently to be confined to the exertion requisite once a month in signing a receipt for their pay. China does not expect them to do what they would be pleased to call their duty. Therefore the observer is justified in concluding that they have been engaged merely to please the foreign nations, and to be dummies in make-believe reform. Were there genuine reform all these men would be "sweated," so great a demand would there be for their services. Even in the case of the Salt Gabelle, which the Government promised to reform in order to provide the security for the Reorganisation Loan, there has been startling and unexpected obstruction. Sir Richard Dane, who started out with the determination to put the Gabelle upon a profitable basis, met resistance at every turn. He was quickly shown by the Peking officials that his presence in China would be better appreciated were he to confine his attention to viewing the sights which other people travel so many miles at their own expense to see. Sir Richard made no headway, and when the deadlock arrived he was compelled to submit his case to the Ministers of the nations concerned in the loan. They deliberated and decided to take the strongest measures to impress upon the Government the fact that the Reorganisation Loan was made to China for reorganisation purposes, and that some evidence of sincerity in this regard would have soon to be given by the Government.

This revelation would seem to suggest that the Government obtained the £25,000,000 upon false pretences, and even the strongest supporters of the present régime find it exceedingly difficult to excuse the unpardonable neglect of the Government voluntarily to apply all the talent available to place the Salt Gabelle and other departments, upon a proper footing. Instead of that the officials actively resist progress. Were that the case in the provinces some excuse could be made on the grounds of misunderstanding of motives, but when the obstruction is carried on in Peking by officials under the thumb of the President it is difficult to understand.

Well-wishers of China were led to believe that there would be an era of progress under the present governing body, but the exhibition of the array of advisers being confined to attending to their own personal affairs is gradually compelling them to believe that they have discovered a reactionary movement where they expected to find a progressive one. Dr. Morrison is perhaps the only continuously busy man. His services are constantly employed. The others are left to their own devices, and spend most of their time in the occupation which made the great Micawber famous. China shows not the least indication of profiting by the experience of Japan, and seems to be content to follow the unprogressive and unprofitable course set by the generations of the years ago. The march of civilisation and the call of the world affect her not. It is lamentable to realise that she seems destined to drift to the point where foreign nations will, for their own protection, be compelled to take charge of the most important of her services. The men now engaged by her at salaries in the vicinity of £3,000 to £4,000 per year, and who could, if utilised, help her on the highway to prosperity, are as follow:

Political Adviser to the President.

Dr. G. E. Morrison (British).

Military Adviser to the President.

Lieutenant Colonel Brissaud-Desmaillets (French).

Advisers for Drafting the Constitution.

Professor Frank Johnson Goodnow (American).

Professor Ariga (Japanese).

Ministry of War.

Major von Dinkelman (German).

Colonel Banzai (Japanese).

Captain Borrey (French).

Ministry of Finance.

Dr. G. Vissering (Dutch), Honorary.

Dr. Arnhold (German).

G. Passeri (Italian).

Ministry of Communications.

G. Baur (German), Technical.

G. Charignon (French), Railways.

Dr. Hirai (Japanese), Railways.

Ministry of Foreign Affairs.

A. H. Eriksen (Dane), Telegraphs.

S. Larsen (Dane), Wireless Telegraphy.

H. De Codd (Belgian), Legal Adviser.

(An appointment has been offered in this Department to Baron Guido Vitale, Italian).

In Connection with the Quintuple Loan.

Sir Richard Dane (British), Salt.

Herr von Strauch (German), Assistant Salt.

N. Konovaloff (Russian), Audit.

H. Mazot (French), Acting Audit.

H. Pfeiffer (German), Loans.

Ministry of Interior, Mongolian Affairs.

F. A. Larson (Swede).

Police Administration

Colonel C. D. Bruce (British).

once become merged in the industrial life of the country. Furthermore China has upon her hands a considerably greater number of troops than are necessary. In the present economic condition of the country the existence of an unduly great proportion of troops is not only a political menace, but is a brake upon the industrial development of the Republic.

Any scheme of disbandment on a large scale without making due provision for the employment of the men whose military services had been dispensed with, would be inviting further trouble. It is beyond dispute that men who have been engaged in military operations, especially those who leave peaceful avocations to take up arms, find it extremely difficult again to settle down to lawful pursuits. Especially is this so in China, where pillage is recognised as an inevitable concomitant of civil strife. Men whose minds have been inflamed by hopes, occasionally realized, of rich plunder could hardly be expected easily to resume the drab and hopeless existence of the Chinese of the lower classes. They have learnt that the ability to carry and fire a gun can secure for them food, clothing and a small stipend, with the additional prospect of achieving comparative wealth should they participate in the sack of a wealthy city. In view of the deadly monotony and the precarious reward for labour that attend the life of the Chinese coolie, it is scarcely surprising to find him disinclined to relinquish his rifle and revert to his hoe, his wheelbarrow or his ricksha. In the unsettled political condition of the country ample opportunity is offered him to join robber bands who levy tribute on the peaceable commercial and agricultural classes.

The method by which these bands of marauders should be eradicated does not fall within the scope of this article. The object in writing is to suggest a means by which, at all events, an augmentation of their number might be prevented. An application of the *corvée* system would go far towards settling some of China's political and economic problems. The country is in a state of arrested development, and there are innumerable public works which, if taken in hand, would add vastly to the national wealth. What China has been able to do under the *corvée* system is attested by the Great Wall, one of the most remarkable human achievements in existence. If the workless element in China could be formed into a disciplined industrial army under strict supervision the return would be out of all proportion to the expenditure involved. China's communications are woefully inadequate; she requires railways, roads and efficient canals. Her mineral resources demand exploitation. Her bare hill-sides call for afforestation. There is work here that would keep millions busy for many years to come, and much of the work would be almost immediately productive. If instead of paying off rebel soldiers they were enlisted in a great industrial army they would become a

source of profit instead of loss to the country. Similarly those of the loyal troops whose services are no longer required could be dealt with in this manner with advantage to themselves and to the nation. To turn them loose with a few dollars speedily to join the ranks of the workless and probably of the bandits, is obviously a short-sighted method of dealing with the problem.

The organisation of such an industrial army would be difficult, but certainly not impossible. These men have been accustomed to discipline of a sort, and it should not prove to be beyond the power of the authorities to divert their labour from an unproductive to a productive channel. China is suffering from a plethora of "Generals;" should they be turned into Captains of Industry and their followers into industrial soldiers, peace and prosperity would the sooner be the portion of the Republic of China.

THE MONTH IN CHINA

Politics and not business continued to engross attention in China during September. The capture of Nanking by Chang Hsun, while it practically put a period to the rebellion, brought the Government face to face with several serious problems. The city was looted and the populace subjected to outrage at the hands of the Government troops. Moreover three Japanese subjects were killed and the Japanese flag fired upon. This caused great excitement in Japan where popular meetings were held at which it was demanded that strong measures should be taken against China. The Japanese Government contented itself with demanding an apology and compensation for the families of the men who were killed. The opportunity was taken at the same time to demand an apology for outrages committed upon Japanese at Hankow and elsewhere. Although the Japanese demands were admitted to be moderate, a stipulation that Chang Hsun should personally apologise to the Japanese Consul at Nanking and that his troops should perform an expiatory march past the Consulate was, it was thought, likely to give trouble. China, however, promptly accepted the demands, and although no less than ten Japanese men-of-war were assembled off Nanking, there was towards the end of the month a reasonable prospect of matters being satisfactorily adjusted. A complication has been caused by an affray between Chinese police and Japanese soldiers at Changli in Manchuria, in which five of the former were killed. A joint committee of Chinese and Japanese officials is investigating this affair.

The most important domestic event was the completion of Mr. Hsiung Hsi-ling's Cabinet and its acceptance by the Parliament. Reference to the new Cabinet will be found elsewhere. Parliament continued its sittings and decided that the Presidential election was to take place early in October.

RAILWAYS, ROADS AND REBELS.

With the practical suppression of the rebellion the difficulties of the Government are still far from having reached the disappearing point. The bands of erstwhile soldiers, who retained their arms when the more or less organised rebel forces were broken up, remain as an unwelcome legacy. Also those who surrendered and were paid off cannot at

Although the business depression continues there have been signs that confidence is gradually being restored and that, provided nothing unforeseen occurs, a marked revival may be expected.

The representations made to the Premier by the British and Russian Ministers, acting on behalf of the Quintuple Group, brought forth fruit. The reform of the Salt Gabelle was one of the stipulations embodied in the Agreement for the £25,000,000 loan, but a reactionary section of the officials in Peking managed to frustrate every effort made to give effect to the clauses relating thereto in the Agreement, and succeeded temporarily in rendering the appointment of Sir Richard Dane, a Salt Expert from India, abortive. The contention of this section was that China herself could adequately reform the Gabelle, and had, in fact, already instituted a service to that end. What was happening was that the commission appointed some time ago by the Government devoted themselves to obstructing every suggestion made by Admiral Tsai Tin-kan, the officer appointed when the Reorganisation Loan was floated, and Sir Richard Dane, and doing nothing to make the Gabelle the organisation it ought to be. Instead of monies being collected sufficient to ensure the service of the loans secured upon the revenue of the Gabelle there was almost an entire suspension of collections—or perhaps it would be more correct to say that there was a suspension of payments to the Treasury. By the end of August conditions became alarming. Sir Richard Dane's investigations disclosed a most disquieting state of affairs, and a meeting of the Ministers of the countries concerned in the loan decided to enter an emphatic protest and to give final warning that unless the Gabelle were reorganised according to arrangements serious steps would have to be taken.

Previous to this, however, Admiral Tsai Tin-kan had been strenuously at work endeavoring to impress upon the Government the necessity of reorganising the Gabelle, not so much because an undertaking had been entered into with that object in view, but because it was absolutely necessary for the welfare of the State. His strongly pronounced views in this direction undoubtedly had much to do in compelling the Government to act after the British and Russian Ministers had expressed themselves. The appointment of the new Cabinet also helped towards a more reasonable attitude, and when they came to consider the question they realised that the old organisation would have to make way for the new one. They consequently announced to the Group that Admiral Tsai Tin-kan and Sir Richard Dane would no longer be obstructed, and that the old Commissioner who stood between them and the Minister of Finance would be removed, the powers erstwhile held by him being conferred upon Admiral Tsai. The Salt Gabelle of China is one of the most ancient services in the land—which

fact can be fully realised upon perusal of the exhaustive article published in the FAR EASTERN REVIEW last December—and its roots are entwined in the very social fabric of those regions where salt is manufactured. Sir Richard Dane is at present making a reconnaissance of some salt producing areas and later on he will devise a scheme for control which will render unto Cæsar that which is Cæsar's without making the people, who have in the past been born to believe that the salt and the earth is theirs to monopolise, feel any particular hardship. The task is a difficult one—but how difficult will not be realised until pressure is brought to bear on the monopolists to yield more than has been their wont to the Central Government.

A development, the full significance of which is not immediately apparent, is the appointment of Admiral Tsai Tin-kan as Controller-General of the Customs, and of Chang Hu as Chief Salt Administrator and Associate Chief Inspector with Sir Richard Dane.

THE QUINTUPLE GROUP

Those who have supported the financial organization known popularly as the Quintuple Group, have always done so with the mental reservation that absolute loyalty among those in the Group was a *sine qua non*. Obviously, as the intention of the Group was to prevent promiscuous borrowing and so safeguard China's credit, the main object for which the combination was formed would be defeated if any one of the partners lent assistance to wild-cat financing of the Crisp type, which provided for one and three-eighths per cent. commission or "squeeze" to the inside clique who held the preliminary agreement to float the loan. Some of the partners have remained absolutely loyal, and it will be remembered that the British Foreign Office resolutely refused to countenance the Crisp Loan last year.

Latterly there have been rumours that all the partners are not absolutely loyal. Statements were current that the allurements of easy profits had been too great for weak vessels, and that an unfair advantage was being taken of those who were keeping the compact in word and spirit. This has led to the conclusion that it would be better for the Group to dissolve except insofar as Central Government loans are concerned and thus terminate a position that had become ludicrous. Far better would it be for China if the Group could continue on the lines upon which it was originally founded, but when there was not perfect loyalty the position had to be faced frankly and independent financing reverted to. The development of industries in China is of the first importance and, much as independent financing is to be deprecated for reasons which need not be recapitulated, as the Group is not able to fulfil its original function, it is much better that each nation should be enabled to make its own arrangements.

DEATH OF MR. WILLIAM CROZIER

It is with the profoundest regret that we have to announce the death of Mr. William Crozier, formerly Editor of the FAR EASTERN REVIEW. At the moment no details are available, except that Mr. Crozier died suddenly at Manila on September 22. Mr. Crozier was one of the best known and ablest newspaper men in Manila and his editorship of the Manila *Daily Bulletin* raised that paper to a very prominent place in the newspaper world in the Philippine Islands. The news of his death will be received with sincere sorrow throughout the Far East in those quarters in which his cheerful personality was known.

CHINA'S CABINET.

The Cabinet chosen by Mr. Hsiung Hsi-ling, Premier and Minister of Finance, has been endorsed by the National Assembly and the Senate. It is generally admitted that the Cabinet constitutes a good team, and, if it holds together, may do useful work for China.

Mr. Hsiung Hsi-ling's record is fairly well known. He has had the advantage of travelling in foreign countries and was Minister of Finance in Mr. Tang Shao-yi's Cabinet. Before taking the Premiership he was Military Governor at Jehol, and the work he did there enhanced his reputation.

Mr. Sun Pao-chi, Minister of Foreign Affairs, has held office as Chinese Minister in France and Germany. He was Governor of Shantung in 1911 when the revolution broke out. Under the Republican Government he was appointed Comptroller-General of the Customs Revenue Council early in 1913 and in June visited Japan on a special mission.

Mr. Chu Chi-chien, Minister of Internal Affairs, was formerly Minister of Communications. As Director-General of the Tientsin-Pukow Railways he performed valuable services for the Government.

General Tuan Chih-jui retains the portfolio of War. He was largely responsible for the reorganisation of the army in the north. General Tuan has been Minister of War from the inception of the Republican Government.

Admiral Liu Kuan-hsiung retains the office of Minister of the Navy. He was educated at the Royal Naval College at Greenwich. In Dr. Sun Yat-sen's Cabinet at Nanking he was Minister of the Navy, and he has the unique distinction of having occupied that post ever since the declaration of a Republican régime in China.

Mr. Liang Chi-chao, Minister of Justice, is well known from his association with Kang Yu-wei in the reform movement which collapsed in 1898, when Kwang-hsu was virtually deposed by

the then Empress-Dowager. Mr. Liang escaped to Japan, and from there assisted materially the reform cause by his writings.

Mr. Chang Chien, Minister of Industry, is a distinguished scholar, who has never accepted an official post, although frequently pressed to do so. His activities have been devoted to trade and industry, and his name is associated with a number of important enterprises.

Mr. Chou Tzu-chi, Minister of Communications, was for some years Chinese Consul-General at New York. Under the Republican Government he was Governor of Shantung and more recently Director of the Bank of China. This appointment is considered an excellent one, as Mr. Chou is a man of progressive ideals, and it is confidently expected that he will do much to advance the important work of railway construction in China.

Mr. Wang Ta-hsieh, Minister of Education, was Chinese Minister in Great Britain for three years and later went to England to study the Constitution. Under the Republican Government he was appointed Minister to Japan.

U.S. RAILWAY BUSINESS FOR APRIL

The total operating revenues of the railways for April were \$237,362,424, an increase over those of April of last year of \$22,893,968 in the aggregate, or 9.7 per cent. per mile of line. This was whittled down by an advance in operating expenses of 12.3 per cent. per mile of line to an increase in net operating revenue of \$1,834,073 in the aggregate, or 2.4 per cent. per mile of line.

The amount of this net operating revenue was \$58,337,434. Taxes for the month took \$10,482,492, an increase per mile of line of 7.9 per cent.; this and shrinkage in revenue from outside operations left operating income amounting to \$47,516,273, an increase of \$810,427 or less than 1 per cent. per mile of line. This aggregate operating income for the 222,156 miles amounts to \$214 per mile of line for the month, or \$7.13 per mile of line per day.

It is the operating income to which the railroads must look for betterments, improvements, new construction, and for interest on bonds and dividends. Except for the fact that there was an anthracite coal strike in April of last year, this operating income for the railways as a whole would not have averaged an increase, and for the railways of the eastern group would have been less this year than last, instead of increasing 14.6 per cent. It was lower per mile of line for these railroads in April, 1912, by 33 per cent. than in April, 1911; and 3.8 per cent. greater in April, 1911, than in April, 1910. For the railways of the southern group this operating income per mile of

line was 16.5 per cent. less than in April, 1912; less in April, 1912, by 1.9 per cent. than in April, 1911; and less in April, 1911, by 14.5 per cent. than in April, 1910. For the railways of the western group this operating income per mile of line was 3.2 per cent. less than in April, 1912; greater in April, 1912, by 2.1 per cent. than in April, 1911; less in April, 1911, by 12.3 per cent. than in April, 1910.

These figures are from the summary of revenues and expenses of the steam railways for the month of April, compiled by the Bureau of Railway Economics from their reports to the Interstate Commerce Commission, and cover the returns of about ninety per cent. of the steam railway mileage of the country.

PUBLICATIONS

(In some instances a more extended notice will appear later).

"Petroleum in Southern California," by F. McN. Hamilton, State Mineralogist.

The territory covered in this volume consists of that part of the state of California which is geographically Southern California and contains the counties of San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, Riverside and San Diego.

A detailed description is given of the various oil fields, about twenty in number, together with analyses of the various kinds of oil found; the names of the companies operating and the number and production of the wells.

The total number of producing wells to March 1st, 1912, was 1,938, abandoned wells 1,115, and wells being drilled 179. The total production in 1911 was 19,288,697 barrels of 42 U.S. gallons and the average product per well per day was for Ventura Co. 4.25 bls.; Los Angeles Co., 25.90 bls. and Santa Barbara 48.47 bls.

No figures are given as to costs of drilling wells, or of cost of production or value of the output. The total productive area is given as 13,020 acres.

The area covered in this report is only part of the oil-producing area in California and the individual fields are smaller than some of those further north. The geological conditions under which the oil occurs are somewhat similar for the various isolated fields. Most of the petroleum produced is a heavy asphaltic grade with small amounts of gasoline and kerosene which is typical of the general California product.

Maps, photographs and geological sections of the various fields give the reader an excellent idea of the conditions obtaining, and on the whole it is an excellent and valuable illustration of the records of applied modern system and engineering science as recorded by the State Mining Bureau.

The publication of these and similar statistics, together with the application of modern methods of geological and engineering science, afford to the specialist and lay reader much valuable information which otherwise would not be easily available.

Modern progress in science is resulting in the publication of new methods and results which tend to aid workers in all parts of the world and to make the winning of wealth from nature more systematized and less complicated.

Petroleum finding at the present day is practically out of the realms of guess work, as after careful preliminary study of the rock formations and the conditions under which

they occur, it is quite possible to locate producing wells and also to predict their output.

The reading of the descriptions of the results of petroleum development in a small part of one state contrast strikingly with the absence of such information regarding any part of China. Some of the financial problems of China would be solved at home by the intelligent development of its known resources of which petroleum is not the least.

The book contains 430 pages, cloth bound, is well illustrated and is accompanied by six maps of the different fields. The price of this publication has been fixed at G. \$1.50, with an additional 22 cents for postage, and may be obtained by applying to the State Mining Bureau, Ferry Building, San Francisco.

"Record Breaking," an interesting little pamphlet issued by the American Blower Company, containing particulars of the forced draft sets supplied by the company to the U. S. men-of-war, Utah and Florida.

"Two Yokes in Transportation." The T. H. Symington Co. of Baltimore, Rochester, Chicago and New York. This pamphlet gives much interesting information about the Farlow Draft Rigging.

Chicago Pneumatic Tool Company's Bulletins for March, April and May, 1913.

The Lovell-McConnell Mfg. Company, 47 Broadway, New York. This Company sends several valuable pamphlets on the Automobile Signal Problem, and leaflets about the Klaxon horn.

"Kahn System Standards." This is the fifth edition of the hand book on reinforced concrete, issued by the Trussed Concrete Steel Co., of Detroit, Michigan. The new edition contains the following new features, which appear for the first time:

Photographic views of various types of Reinforced Concrete structures; Interior views of various types of Reinforced Concrete floor construction; Complete Specification for Reinforced Concrete; Illustrated discussion of the advantages of Reinforced Concrete Construction; Tables of comparative cost of Reinforced Concrete, Wood Mill Construction and Structural Steel; Floredome and Floretyle Construction; many new tables, including those for beams and also a complete revision of the text matter. "Kahn System Standards" is divided into sections covering completely the following matter: Advantages of rigid connection of shear members; Properties of Kahn Building Products; Advantages of Reinforced Concrete Construction; Specifications for Reinforced Concrete; Theory of Reinforced Concrete; Typical Installations; Illustrations of various floor constructions; Complete tables covering solid concrete slabs, reinforced with Kahn Trussed Bars, Rib Metal and Hy-Rib; Tables for Floredomes, Floretyles and Terra Cotta Tile floors; Tables for Reinforced Concrete beams, Square Columns and Hooped Columns; Tables for Reinforced Concrete Footings; Materials in concrete and mortar and Estimating Table. "Kahn System Standards" is issued primarily for practising Architects, Engineers and Contractors, to whom it is distributed free. To others a nominal charge of 50 cents per copy is made.

"The Britannic Question," by Richard Jebb. Longmans, Green & Co., New York, Bombay and Calcutta.

"The Flowery Republic," by Frederick McCormick. D. Appleton & Company, New York.

"Cook's Far Eastern Handbook." The July-December, 1913 edition of this excellent publication, gives a mass of information relative to steamer routes, railways and fares.

"Slavery and Peonage in the Philippine Islands," by Dean C. Worcester, Secretary of the Interior. Bureau of Printing, Manila.

THE UNIVERSITY OF HONGKONG

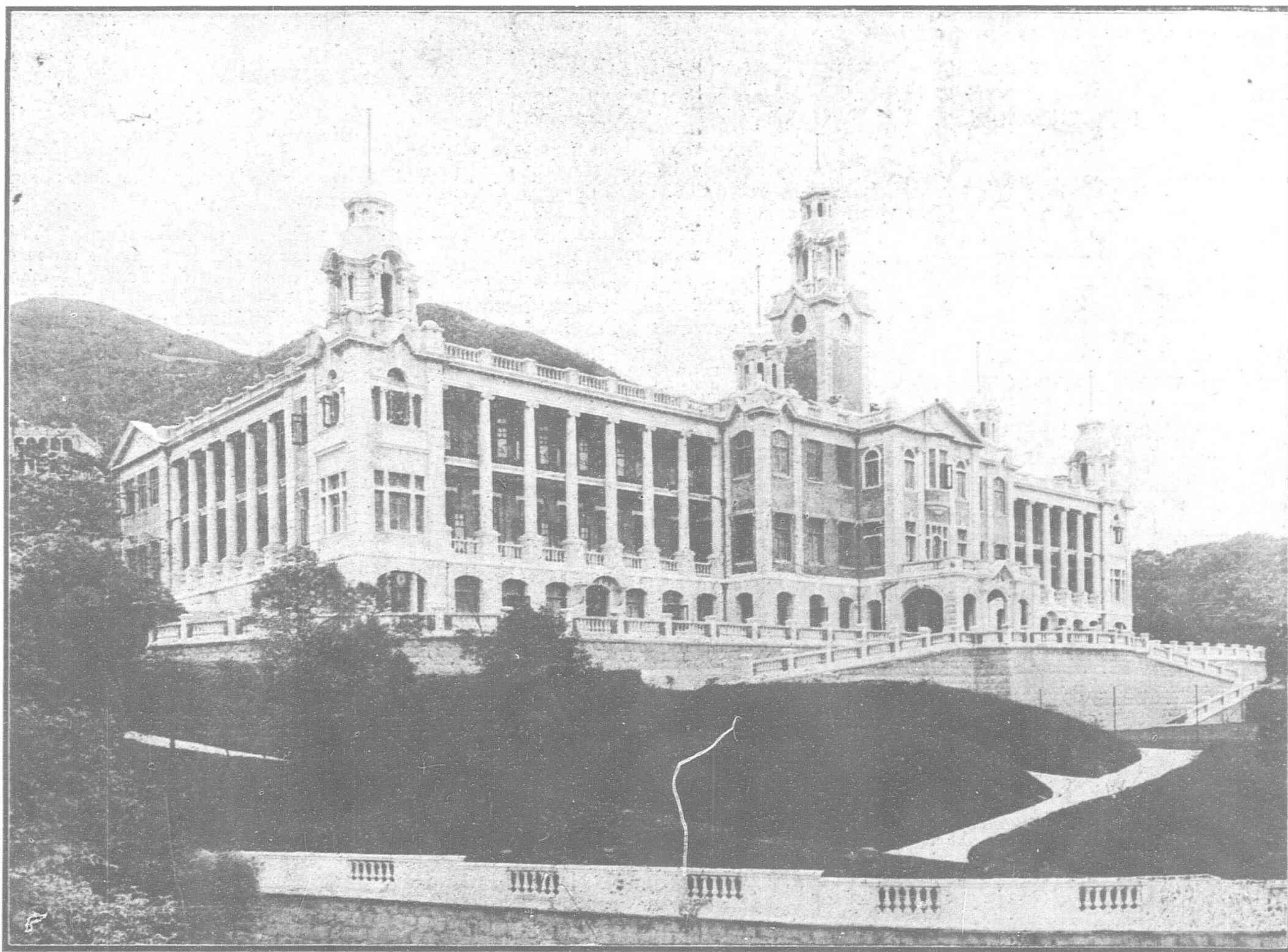
HISTORICAL SKETCH OF THE INSTITUTION

The idea of establishing a University in Hongkong was first suggested in 1905, but it was two years later before the matter took definite shape. The Governor of the Colony, Sir Frederick Lugard, advocated the formation of a University in a speech made in December, 1907. Mr. H. N. Mody at once offered to erect the necessary buildings at a cost of \$150,000 and to give \$30,000 towards an endowment fund.

At the time that this offer was made, there was already on foot a project for enlarging the scope of the Hongkong College of Medicine. This Institution had been founded in 1887, under the style of the College of Medicine for the training of Chinese students in Western medicine, and after twenty years of patient work it was incorporated by Local Ordinance

Secretary, the Hon. Sir Paul Chater, Kt., C.M.G., the Hon. Mr. A. M. Thomson, Colonial Treasurer, the Hon. Mr. W. Chatham, C.M.G., Director of Public Works, the Hon. Dr. J. M. Atkinson, Principal Civil Medical Officer, the Hon. Mr. H. E. Pollock, K.C., M.L.C., the Hon. Dr. Ho Kai, C.M.G., M.L.C., the Hon. Mr. W. J. Gresson, M.L.C., Mr. E. A. Irving, Director of Education, Mr. J. C. Thomson, Dr. G. P. Jordan, Mr. Murray Stewart, Mr. D. R. Law, Mr. F. B. L. Bowley, Crown Solicitor, and Mr. Cecil Clementi, Assistant Colonial Secretary, was convened by the Governor on the 18th of March, 1908, to consider the project of establishing a University, and at its first meeting a Sub-Committee was appointed to draw up an estimate of the cost of the necessary building and equipment. The Sub-Committee, of which the Hon.

a University an endowment fund of not less than £100,000 and an equipment fund of not less than £10,000 should be secured; and it was suggested as a way out of the difficulty that if a larger sum were not available a building should be erected at a cost of \$150,000 in which the Hongkong College of Medicine and the Technical Institute might be accommodated in order to form a nucleus of the proposed University pending the collection of an adequate endowment fund upon which to establish the University. This scheme was approved by the Hongkong College of Medicine and by the Committee, but it did not fulfil the condition under which Mr. Mody had made his offer, viz., that the University should be incorporated so soon as the building was erected. The difficulty as to the cost of the buildings was overcome



Hongkong University

in 1907 under the new name. Up to this time (1907) one hundred students had been enrolled, and of these thirty-one had passed as Licentiates. The College had no building of its own, students lived in their own houses or in lodgings, and the lectures were delivered by permission at various Hospitals and Institutions. Stimulated by a bequest of \$10,000 from Mr. Tang Chuk Kai, and of \$50,000 from Mr. Ng Li Hing, and by the grant of a small site by Government, the Court of the College made an appeal in 1908 for further funds to erect College buildings and to engage a small permanent staff.

A Committee consisting of the following gentlemen under the Chairmanship of the Governor:—Bishop Lander, Bishop of Victoria, the Hon. Mr. F. H. May, C.M.G., Colonial

Sir Paul Chater was Chairman, presented a report on September 25th, 1908. The report with its enclosures and estimate was very lengthy, but the gist of it was that it would be impossible to erect buildings, adequate for the purpose in view, at a cost covered by the amount promised by Mr. Mody.

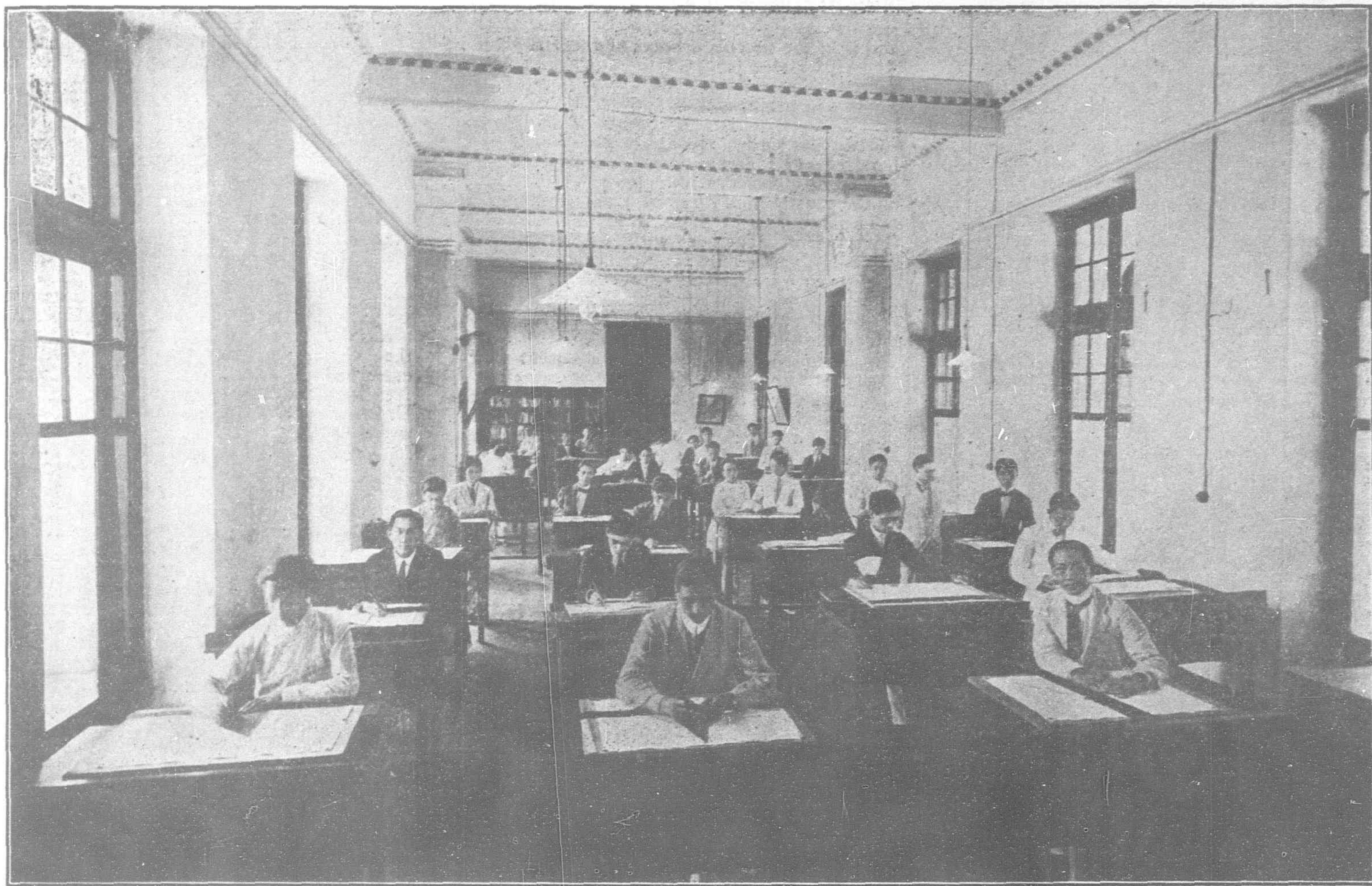
On the presentation of the report it was proposed to accept Mr. Mody's offer to erect a building at a cost of \$150,000, in which the Hongkong College of Medicine and Technical Institute should be located, and to incorporate a University under Ordinance.

Objections were raised to this proposal on the grounds that the cost of adequate buildings and equipment had been underestimated and that before any steps were taken for establishing

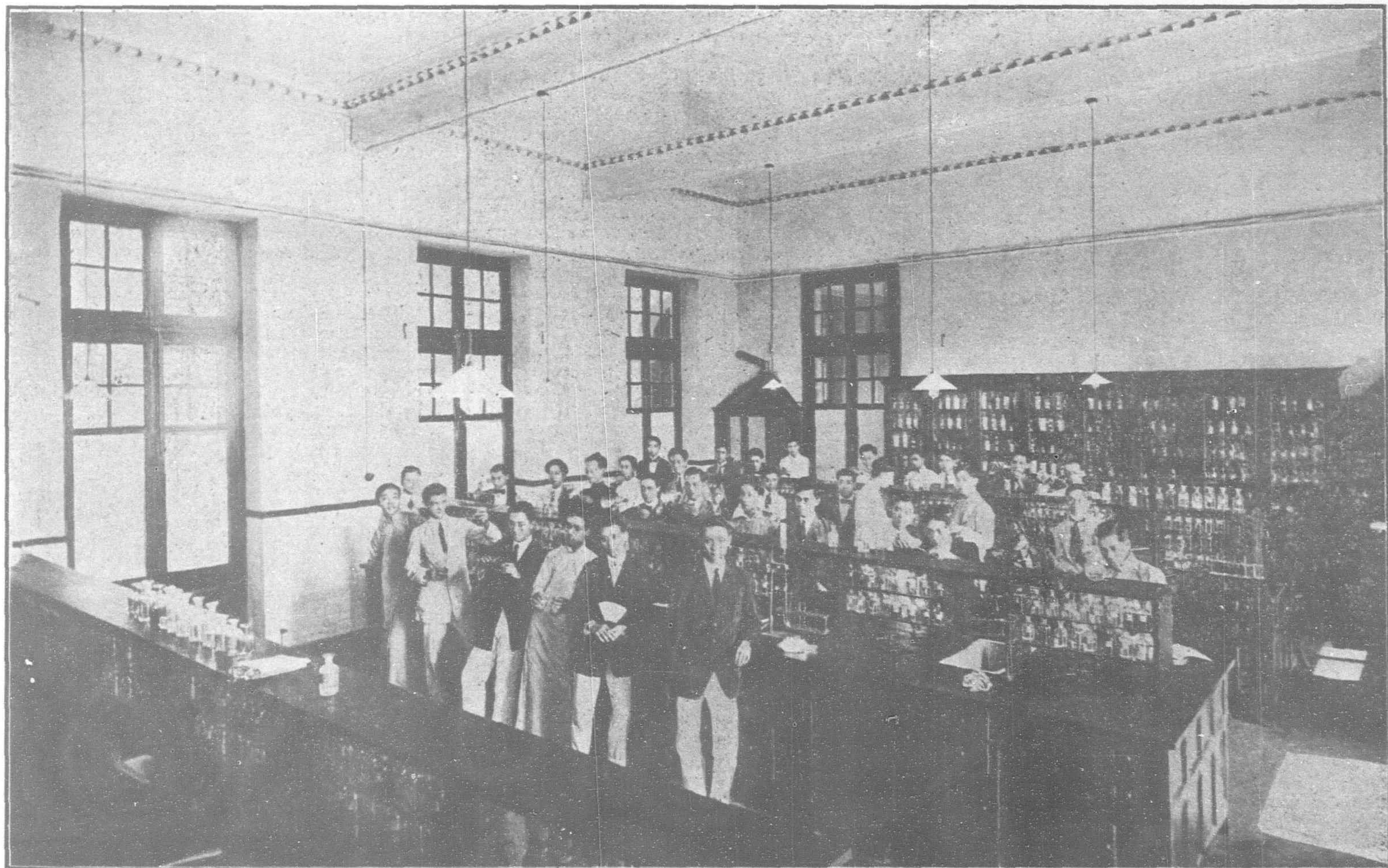
by the generosity of Mr. Mody, who undertook to erect them whatever the expense, but would not be responsible for furnishing or equipment or for any donation to the Endowment Fund if the cost of the buildings should exceed \$180,000.

The Committee owing to departure of certain members from the Colony had undergone some changes in its personnel and was now constituted as follows:—

H.E. Sir F. D. Lugard, Chairman, Bishop Lander, Bishop of Victoria, the Hon. Sir F. H. May, Colonial Secretary, the Hon. Mr. A. M. Thomson, Colonial Treasurer, the Hon. Mr. W. Chatham, Director of Public Works, the Hon. Mr. A. W. Brewin, Registrar General, the Hon. Sir Paul Chater, Mr. H. N. Mody, Mr. E. A. Irving, Director of Education, the Hon. Dr. Ho



HONGKONG UNIVERSITY.—The Drawing Office



HONGKONG UNIVERSITY.—The Chemical Laboratory

Kai, the Hon. Mr. Wei Yuk, Mr. C. Clementi, Mr. Lau Chi Pak and Mr. A. Turner.

At this juncture Messrs. Butterfield & Swire and allied firms came forward on the initiative of Mr. J. H. Scott, senior partner of J. Swire & Sons, with a donation of £40,000 which, joined to the generous subscriptions of the Chinese of Hongkong and Canton, made the ultimate success of the project practically certain. The Secretary of State notified his consent to the grant of the proposed site and cordially approved the project, which the China Association also warmly supported. The Viceroy of Canton (H.E. Chang Jen Chung), who exhibited great enthusiasm for the scheme, issued an official Manifesto inviting subscriptions towards it, and setting out the grounds upon which he considered it to be a benefit to China. Sir Robert Hart wrote in commendation, as also did the Governor of the Straits Settlements, the Governor of Macao, and the Municipal Council of Shanghai. The Government of China made a grant to the fund, while the work of a Chinese Committee consisting of Dr. Ho Kai, Mr. Wei Yuk, Mr. Lau Chi Pak and one hundred Chinese gentlemen in collecting subscriptions was so successful that the Chinese communities of Canton, Macao, Saigon, Newchwang, Amoy, Penang, Waichow and Australia, added their subscriptions to those of the Hongkong Chinese community, and finally the British Government intimated that the Imperial Exchequer would provide £300 per annum for scholarships for British subjects, and that His Majesty had been graciously pleased to direct that the holders should be called "King Edward VII Scholars" as a token of his personal interest. Before the end of the year 1909 the Endowment and Equipment Fund had reached the sum of \$1,279,164.

Mr. Mody's generous gift was now accepted unconditionally, and the erection of the building commenced forthwith.

The University was incorporated under Hongkong Ordinance and came into existence on March 30th, 1911.

The Foundation Stone was laid on March 16th, 1910, and in the course of the ceremony, the Governor read a telegram from the Secretary of State to the effect that His Majesty had created H. N. Mody, Esq., a Knight Bachelor. Delegates of the Viceroys of Canton and Nanking were present and spoke at the ceremony.

By March, 1912, the main building was practically completed. A house for a Principal, and houses for two Professors had also been erected, and on the 11th of the month the University was formally opened by His Excellency Sir Frederick Lugard, who received the Buildings from Mr. N. H. Mody, son of the late Sir Hormusjee Mody, in the name of the University. One of the leading Chinese citizens of Hongkong, the Hon. Dr. Ho Kai, was created a Knight Bachelor.

Sir Charles Eliot, Vice-Chancellor of the Sheffield University, was appointed Principal and Vice-Chancellor and arrived in June, and the necessary nucleus of the staff having been brought together the three Faculties of Medicine, Engineering and Arts were working in October.

The success of the University was assured from the first opening of its Registers, for all the available hostel accommodation was quickly taken up and the C.M.S. Hostel (St. John's Hall) was compelled to extend.

PRESENT POSITION OF THE UNIVERSITY.

The Buildings consist of the Main Building, the Quarters for the Staff, a University Hostel and a School of Anatomy, the last two being in course of erection. The main building contains lecture rooms, etc., calculated to afford accommodation for five hundred Undergraduates, and it is planned so as to be capable of extension.

The chief feature is the Great Hall eighty feet by fifty feet with domed roof forty-three feet high.

There are eleven class rooms and eight laboratories and workshops, with libraries, a common room for students, and committee rooms, offices, and coolies' quarters in basement.

The University is built on perhaps the finest site available for the purpose on the Island and is in the neighbourhood of the Hospitals, whose proximity is a necessity for the instruction of Medical Students. It is located on the side of a hill, and in addition to the large area occupied by the buildings it has been found possible to provide a playground two hundred and seventy-five feet square, by expending a considerable sum on levelling and on the construction of retaining walls.

The site has been given by the Colonial Government, together with a large space immediately adjoining for Residential Quarters for Students, and a smaller space for the erection of an Anatomical Laboratory. The whole comprises an area of 709,789 sq. ft., situated two hundred feet above the sea and overlooking the City of Victoria, with a magnificent view over the Harbour.

Immediately below the University is the site upon which the Church Missionary Society have built a Hostel (separated only by a public road from the University grounds), and it is understood that the Roman Catholic Mission will probably build another in the immediate neighbourhood. Directly above the University grounds is the site acquired by the London Missionary Society for a similar purpose; their hostel is almost completed.

The cost of the buildings and preparation of the ground, which was borne by Sir H. N. Mody—whose death was an irreparable loss not only to the University but to the Colony—is approximately \$345,000. The value of the sites given by the Government is estimated at \$176,297; the cost of the Anatomical School is estimated at about \$30,000, most of which sum was separately raised by the Chinese.

OBJECTS.

The objects which the University has in view are described in the Preamble to the Ordinance of Incorporation as the promotion of Arts, Science and Learning, the provision of higher education, the conferring of degrees, the development and formation of the character of students of all races, nationalities, and creeds, and the maintenance of good understanding with the neighbouring country of China. With reference to the first two of these objects, it was stated in various speeches which were made at the time when the scheme was inaugurated, more especially in those delivered at the laying of the Foundation Stone, that the desire of the promoters was to begin with Faculties (Medicine and Engineering) which would be of practical utility to China in coping with disease, in developing her resources by railways and by the exploitation of her mineral wealth, and in checking by the light of modern engineering science the terrible floods which almost every year occasion famines and great loss of life.

To these has been added, at the special request of the Chinese residents in Hongkong, a Faculty of Arts. The courses given in this faculty include Chemistry, Physics, Mathematics, History, and the English and Chinese languages and literature and a general course in Political Economy. More specialised courses in this subject have recently been provided by the generosity of Mr. Cheung Pat Sze and his partners, who have also secured the establishment of a course in International Law and Jurisprudence. The special courses in Political Economy are, (1) Economic Theory and Statistics; (2) Economic and Constitutional History; (3) Descriptive Economics; (4) Commercial Law and Practice, Business Organisation and Accounting; (5) Public Administration and Finance. It is hoped that they will be useful to those who wish to enter the public service of their country and also to those who contemplate a business career.

The next point mentioned in the Ordinance is the Conferring of Degrees. That the degrees of the University should be equal to those conferred by British Universities was a fundamental proposition, and it was on this basis that the subscriptions were raised. The Viceroy of Canton (His Excellency Chang Jen Chun), who was an ardent supporter of the University, asked for an assurance on this point, and when satisfied issued a striking

manifesto in support of the scheme. The original Committee recorded by resolution that the Degrees should be equal to those of a British University, and this has been confirmed by a Resolution of the University Court.

The third object is stated to be "the development and formation of the character of all races, nationalities and creeds." With this object in view it was provided by section 20 of the Ordinance that the University should be Residential, *e.g.*, that all students must reside in the quarters provided, or in Hostels founded by religious bodies and conducted under Regulations approved by the Council. It is intended further to promote the association of Staff and Students, so that the former may exert a good influence. It is hoped that association in games will have this effect, and the Government of the Colony recently presented a site for a second field four hundred feet long and half as broad. The University Union is at present engaged in collecting funds to level the area. The root idea of the University of Hongkong is to provide a place for Higher Education where Chinese youths can remain under the influence of their own parents and guardians in the environment of their own people. Here they will be subject to the strong control which Chinese opinion exerts upon young men, instead of being adrift in a foreign country where a liberty unknown to students in the East is allowed to Undergraduates.

It is hoped that in founding the University a service has been rendered to all the schools of South China and indeed of China as a whole. The time has come for the co-ordination and standardising of the excellent work done by the Hongkong Government schools and other educational establishments, and the best method of securing this result is the establishment and recognition of a Matriculation Examination which can be used as a School Leaving Examination. University Authorities have devised their Matriculation Examination with this end in view. They hope and believe that the present syllabus is sufficiently elastic and yet sufficiently exacting to satisfy the requirements of those schools in which English is a medium of instruction, and they are prepared to hold examinations at various centres on receipt of a reasonable number of applications. Such applications, which may conveniently be forwarded through the Headmasters of Schools, should reach the Registrar at least three months before the date of the examination.

Finally the Ordinance of Incorporation states that it is the object of the University of Hongkong to promote a good understanding with China. The scheme has been welcomed by prominent Chinese, both statesmen and private persons, as well as by Chinese communities both in China and abroad.

CONSTITUTION.

The constitution of the University provides for a Court composed of life, ex-officio, and nominated members numbering at present forty; of a Council consisting of seventeen members partly elected by the Court, partly by the Senate, and partly ex-officio; and of a Senate consisting of the Principal, the Staff of the University, and the Director of Education for Hongkong. The Governor of the Colony is ex-officio Chancellor, and it will be noted that the Principal Civil Medical Officer, the Director of Public Works, the Director of Education and the Registrar General (Protector of Chinese) hold ex-officio seats on the Court and Council, thereby identifying the local Government with the University, securing their help and experience, and ensuring a continuity of policy. The Principal is Vice-Chancellor and President of the Senate.

LIST OF OFFICERS.

The following are the office holders:

Patron:—His Majesty the King.

Chancellor:—His Excellency Sir Francis Henry May, K.C.M.G., B.A.

Vice-Chancellor:—Sir Charles Eliot, K.C.M.G., C.B., M.A., D.C.L., LL.D.

Pro-Vice-Chancellor:—G. P. Jordan, M.B., C.M., M.R.C.S.

Deans:—Francis Clark, M.D., M.R.C.P., D.P.H., D.T.M. & H. (Faculty of Medicine); C. A. Middleton Smith, M.Sc., M.I.M.E. (Faculty of Engineering).

Registrar:—A. C. Franklin, F.I.C.

THE COURT.

Major-Gen. C. A. Anderson, C.B.; Hon. Mr. John A. Bucknill, K.C.; Chan Chik Yü; Chan Kang Yü; Hon. Sir C. P. Chater, Kt., C.M.G. (*Treasurer*); Hon. Mr. W. Chatham, C.M.G.; Chau Siu Ki; *Cheung Pat Sz; Chiu Yü Tin; *Dr. Francis Clark; Hon. Mr. C. Montague Ede; G. T. Edkins; Sir Charles Eliot, K.C.M.G., C.B.; *Dr. R. M. Gibson; Hon. Mr. E. R. Hallifax; Hon. Mr. E. A. Hewett, C.M.G.; E. A. Irving; Dr. J. T. C. Johnson; *Dr. G. P. Jordan; *Hon. Sir Kai Ho Kai, C.M.G.; Lau Chu Pak; *Sir Frederick Lugard, C.M.G., C.B., D.S.O.; *H.E. Sir Francis Henry May, K.C.M.G. (*Chancellor*); Hon. Mr. C. McL. Messer; N. H. N. Mody; Ng Hon Tsz; Ng Li Hing; *Rev. T. W. Pearce; *Hon. Mr. H. E. Pollock,

THE SENATE.

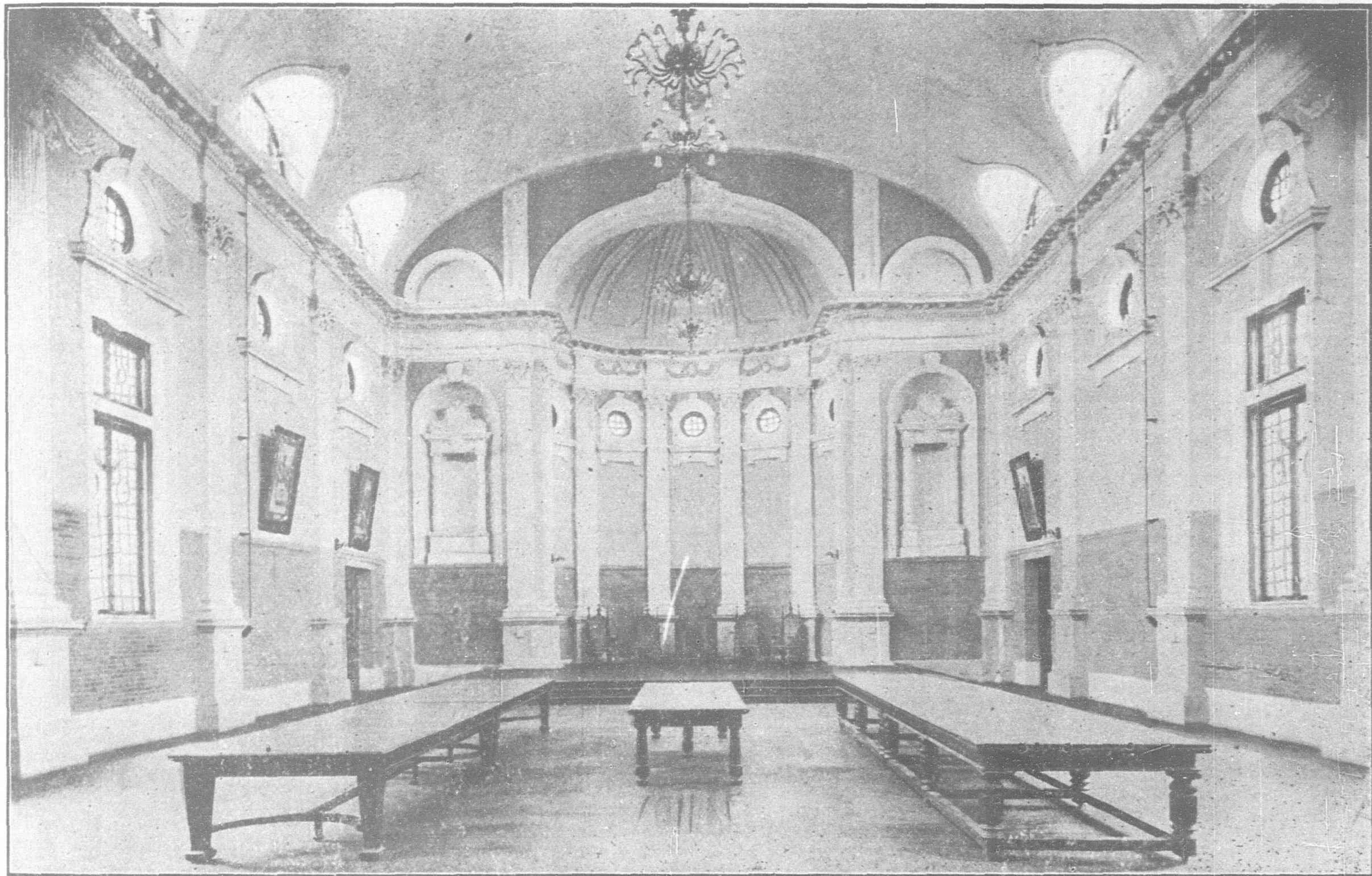
Sir Charles Eliot, K.C.M.G., C.B., D.C.L., M.A., LL.D., *Chairman*; G. P. Jordan, M.B., C.M., M.R.C.S.; Francis Clark, M.D., M.R.C.P., D.P.H., D.T.M. & H.; C. A. Middleton Smith, M.Sc., M.I.M.E.; W. J. Hinton, B.A.; K. H. Digby, M.B., B.S., F.R.C.S.; C. Forsyth, M.D., CH.B., F.R.C.S. ED; A. C. Franklin, F.I.C.; E. A. Irving; W. V. M. Koch, M.D., C.M.; H. Macfarlane, D.P.H., D.T.M. & H.; O. Marriott, M.D., B.S.; T. H. Matthewman, M.Eng., A.M.I.E.E.; A. E. W. Salt, M.A.; E. J. Surman, B.Sc.; A. G. Warren, B.Sc. Eng., A.M.I.E.E.; J. D. Wright, M.A.

Commenting on the University and its work, the *Engineer* says "The majority of students have decided to take up engineering work, and, as the University has very limited funds at its disposal, it seems almost a pity that the technical and scientific departments were not fully developed before any attempt was made to establish other Faculties. In a word, it would probably have been better, so far as British

engineers; in India there is none. The native of India has no genius for work, while the Cantonese, or Southern Chinese, are born mechanics, and are both industrious and ingenious.

Many British engineers in the Far East are honestly alarmed at the training of these men scientifically, but China is a large country, and the immediate engineering requirements so enormous, that the problem will not become serious during the present generation. And in any case the Chinese mean to be trained in technology. If British engineers do not train them, other nationalities will. It is emphatically in the interests of Great Britain to develop the technological departments of the University, so that students will be attracted from all over the East to this British Colony, where they will learn British ways and see and use British machines.

"There is, as is becoming only too well known as a result of experience, a great



HONGKONG UNIVERSITY.—The Great Hall

K.C.; Right Revd. Bishop Pozzoni; Sir William Rees Davies, C.J.; Hon. Mr. D. Landale; D. K. Sethna; Hon. Mr. C. Severn; Hon. Mr. E. Shellim; Professor C. A. Middleton Smith; N. J. Stabb; Hon. Mr. A. M. Thomson; Right Revd. Bishop Lander; Hon. Mr. Wei Yuk, C.M.G.

THE COUNCIL.

Sir Francis Henry May, K.C.M.G., B.A., *Chairman*; Sir Charles Eliot, K.C.M.G., etc., etc., *Vice-Chancellor*; G. P. Jordan, M.B., M.R.C.S., *Pro-Vice-Chancellor*; Hon. Sir C. P. Chater, Kt., C.M.G., *Treasurer*; Hon. Mr. W. Chatham, C.M.G.; Francis Clark, M.D.; Hon. Mr. E. R. Hallifax, B.A.; E. A. Irving; J. T. C. Johnson, F.R.C.S. ED; Hon. Sir Kai Ho Kai, C.M.G., M.B.; Lau Chu Pak; Oswald Marriott, M.D.; Mr. Evan Ormiston; Hon. Mr. H. E. Pollock, K.C.; C. A. Middleton Smith, M.Sc.; Hon. Mr. Wei Yuk, C.M.G.

* Life Members.

interests in China are concerned, to have established a large school of technology in Hongkong, and to have allowed it gradually to expand into a university, first of all by affiliation with the existing Medical College—founded twenty years ago—and, later on, by the establishment of other Faculties. However, there were many conflicting interests to be considered, and the University is now an established fact, and must be dealt with as it is.

"The student at Hongkong pays £30 per annum for his instruction alone—in India he pays little or nothing. In Hongkong they obtain men drawn from the right class; men who will be able to influence the financial side of engineering work. Again, in India most of the work is done under Government. In Hongkong business men are on the Council of the University, and a great deal of money has been subscribed to it from the business "Hongks," or firms interested in the trade of the Far East. Here there is a demand for native

struggle among the nations for trade, especially in engineering equipment used for developing the national resources of new countries. What has already happened in Japan, South America and Africa were mere skirmishes; the pitched battle which will decide the question of trade supremacy will be fought in China.

"It may be taken as settled that in the near future neither British nor American nor German engineers will be employed by the Chinese Government either in construction or administrative work. The Chinaman is to fill these positions. Hitherto it has been the object of firms desiring to do business in China to place men of their own training in positions of influence there. This system has been successful all the world over, and to some extent it has hitherto succeeded in the East. But the foreign engineers who now fill positions of influence in China are few, and those few

(Continued on page 159)

POWER STATION AT BANGKOK

DESCRIPTION OF THE EQUIPMENT

The following interesting article appeared in the *Bangkok Times* of July 20:—

In two or three months' time the Government Power Station at Samsen will be completed, and the elaborate plant installed in running order. At present the Station is in a position to supply current, but a certain amount of work, of course, still remains to be done, and, considering the nature of the undertaking, as far as it has gone it has been expeditiously carried out. At the beginning of the year the buildings were in their embryo state, and it was not until the middle of April that the installation of the turbines was commenced.

When all is completed Bangkok will have a Power Station probably superior to any East of Suez as regards the up-to-dateness of the plant. The design of the buildings and the construction specified is of a kind which experts say could not well be beaten, and the plant throughout is of the very best and most up-to-date description. The turbo-generators and condensers, the latter with its turbine driven pumps, are the first of their kind in any station East of Suez and represent quite the latest practice in turbine work.

Naturally enough such work has not been done cheaply. From start to finish it will cost the Government a million and a half ticals. A million has already been spent, and Tcs. 100,000 was recently voted. Though some may hold that much the same result might have been obtained more cheaply, the Government rightly consider that it is better to have a thing done in the best possible way if the money is available, and in the present station there is certainly value for the funds expended. With careful and businesslike management the scheme will repay the outlay in a few years, and, in the course of years, be a source of considerable profit.

Besides supplying power for the Waterworks and the Opium Farm the Station will provide for the lighting of a large area where many of the Siamese Royalty and nobility reside, and we understand the area will be extended as the opportunity presents itself.

THE DESIGN

The design of the buildings and all the specifications for plant were in the hands of Mr. F. B. Shaw, the Electrical Engineer, and the care and foresight which he has displayed is worthy of all praise. Every contingency has been provided for, with due regard to local conditions, and the specifications were such that only two or three firms of world-wide repute were able to comply with the whole of them in their tenders.

The tender finally accepted was that of the A. E. G., and they are now carrying out the work with Mr. N. E. Duftie in charge, Mr. H. Scott being his second in command. The turbine expert is Mr. M. Potschke. Mr. Tennant is installing the switchboard for British Thomson-Houston Co., and Mr. Davies, representing the Tudor Cell Co., has just arrived to supervise the construction of the batteries. Babcock and Wilcox boilers have been installed by Mr. A. Rose, and Mr. J. T. Russell is in attendance as the representative of the firm. Mr. G. Kluzer has had the contract for building.

AN EXCELLENT SITE

The Department were fortunate in the first place in being able to secure an excellent site for the Station. Most important of all, it is on the river and close to the centre of distribution. Its situation is, in fact, the nearest point on the river from the Waterworks.

The most valuable principle of construction is that fuel can be got to the station above the boiler room without being touched by hand from start to finish. Two wharfs have been built where steamers can come alongside at all states of the tide, and immediately behind one

is the big paddy husk store, paddy husk being, of course, the chief fuel to be used.

A steel paddy husk conveyor will lead from the river bank to the store, and, by means of a spiral in the conveyor worked by a motor, the husk will be conveyed from the hopper to the top of the store, in which a month's supply of fuel can be contained. It is a big building, and to the uninitiated looks big enough to contain sufficient fuel to withstand a fuel famine, but paddy husk is bulky. A second conveyor runs just underneath the roof, distributing the fuel along the building. A third conveyor runs from the middle of the building to the hopper erected over the boiler house, where a week's supply can be stored.

THE POWER OF CONCRETE

Reinforced concrete plays a large part in the construction of these buildings, as, indeed, it does throughout the station. In a number of cases ferro-concrete has been put to new uses, and the limits of this remarkably useful building asset have yet to be found. Mr. E. G. Gollo has been very successful in evolving new methods of employing it, and evidences of his ingenuity are to be seen throughout the Power Station construction.

The walls of the store house are curved inwards, as all the pressure will be from the inside, and it has only been necessary to make them of one brick thickness. Columns, beams, and cross-beams are of ferro-concrete, and the pressure is distributed to them.

The second wharf is connected with the main building by a railway, along which heavy material can be conveyed after being landed from the river. Running under the wharf is a steel pipe, 80 c.m.'s in diameter, so constructed that it is below the lowest water level. Connecting with the pipe is a tunnel, 1¼ metres high, and running underneath the foundations of the power house.

CONSTANT WATER SUPPLY

Thus there will be a constant supply of water for the condensers of the steam turbines, and it will first pass through a filter at the mouth of the tunnel. Thousands of gallons of water a minute will be required, but by the method employed a constant supply is assured with the minimum expenditure of energy.

The water, after being pumped through the condensers, is allowed to return by way of the boiler house, passing underneath the paddy husk furnaces, and thus carrying all the burnt paddy ash by a culvert straight out to the river. This culvert was provided for in making the foundations of the big husk store house. By being able to obtain a constant supply of water without pumping a big advantage is obtained over most stations, and it was only in building on absolutely virgin soil that such a result could be arranged for in construction.

The boiler house has an inverted roof of ferro-concrete forming the floor of the husk hoppers built over the boilers. The second store house has had to be very solidly constructed seeing that it is built over the boiler house, but by this method considerable space is saved, and the saving in labour eventually will be enormous. This design of Mr. Shaw's is ingenious, and it is the first time that husk hoppers in ferro-concrete have been constructed.

In this, the highest part of the building, are two tanks of water to supply the Grinnell's fire extinguishers which are to be installed. These extinguishers are capped with a special alloy of lead which melts at a certain temperature and allows the water to pour down. There is also a special motor pump for the supply of the fire hydrants at different points around the buildings.

THE BOILER HOUSE

Coming next to the boiler house, Babcock and Wilcox boilers have been installed for the A. E. G. by Mr. A. Rose. There are sixteen steam drums, together comprising four batteries of boilers, and each independent of the other. While paddy husk is the primary fuel, liquid fuel, coal, and firewood can also be

used, and all the furnances can be readily adapted for the use of any one of these. Liquid fuel will also be stored overhead, but only for use in the event of paddy husk giving out. Superheated steam will be used entirely for the steam turbines, the boiler pressure being 200 lbs. to the square inch. They have been tested up to 400 lbs. The heating surface of each battery of boilers is 6,480 square feet, while the heating surface of the superheater is 1,980 square feet. One boiler will be kept always for liquid fuel. The chimney in connection with the boilers is of steel, and one of the highest in Bangkok, being 162 feet from ground level and eight feet in diameter. Besides the boilers, Mr. Rose also supplied the conveyors for the New Conveyor Company, Ltd., Birmingham.

"KERNEL OF THE STATION"

Next to the boiler one comes to the whole kernel of the Power Station in the turbine room. The plant is of the most modern type only perfected about a year ago.

The condenser room, under the three turbines, is below the river level. The pumps here are driven by a small steam turbine, whereas in old plants pumps had to be driven by separate steam engines or electric motors. With the modern developments here employed all the generating plant is contained in a few cubic yards. The pumps will be working with a maximum of efficiency as the head of water will be the minimum possible.

One object aimed at in designing the station was to have one bank of boilers, one turbine, and one condenser complete, so that if the station were divided into three sections each would work perfectly well and independently of the other. Any part is interchangeable, so it is only necessary to keep spare parts for one set.

In the turbine room one first notices that there is no mass of steam piping to be seen. Here everything is below, so in the event of a pipe bursting no one can be hurt. It also has the effect of making the engine room much cooler. The engine room is a narrow building with big doors at each end, so that a strong current of air comes through.

THE TURBINES

The three turbines are of 1,000 kilowatts each, and for their size are certainly the most efficient of the day. They are of the Multi-Stage Curtis type, entirely different to previous systems, and it has proved so successful in Berlin that it is spoken of as the system of the future. The plant includes the latest type of boiler feed pump driven by a small Curtis turbine, and capable of delivering water against a boiler pressure of 300 lbs. to the square inch.

The switchboard, thanks to the new devices employed, is largely automatic in action, and will not require constant attention. It includes an automatic device for regulating the voltage and keeping it steady. All the high tension gear (3,500 volts) is enclosed in a brick room at the switchboard. All the switches which operate the current are of the latest oil-immersed pattern with remote control. Each of the three turbines and the motor generator is controlled by a separate panel in the switchboard. A feature of the switchboard is the lightning resistors, which relieve the very high pressure caused by a flash of lightning striking the overhead wires and thus protect the generators from damage. Each generator has an instrument for integrating the number of units, so that the output of the station may be calculated exactly. It can also be indicated where any leakage takes place, and on what part of the line.

A large Tudor battery is being installed with a capacity of 2,600 amps. in five hours. There are 110 cells in the battery.

CONCRETE POSTS

It is worthy of note that all the posts to which the wires will be attached are of reinforced concrete, and are being made on the Station premises by Messrs. Kluzer and

(Continued on page 159)

MINING IN THE FEDERATED MALAY STATES

BY COMMERCIAL AGENT, D. C. ALEXANDER, JR.

INTRODUCTION

The Federated Malay States comprise the four Federated States of Perak, Selangor, Nigri Sembilan, and Pahang, and the three native States of Kedah, Kelantan, and Trengganu (recently ceded by Siam), having a total area of nearly 43,000 square miles. It may be expected that, in course of time, the now nominally independent State of Johore will also enter the federation. Each State is governed by a British Resident, in the name of the Malay Sultan; and Federal authority, both executive and legislative, is in the hands of a high commissioner, who is also governor of the Straits Settlements, and the Federal Council, all appointed by the Crown.

The development of the colony has been marvelous. In the early days tin mining was the only industry of importance, but in the past 10 years the cultivation of rubber has received almost equal attention, and in 1910 the area planted in rubber (295,000 acres) exceeded that under mining lease. Out of the very large profits of the miners and planters the State and Federal Governments have taken a heavy tithe in the form of export duties, but the sums so collected have been wisely expended in opening up the country by the building of roads, railways, and harbors. Of metaled roads there are now over 2,000 miles; while the Federal Railway has a mileage of about 650, which is being rapidly increased. Notwithstanding the heavy capital expenditure required by these improvements, the Federated Malay States are not only free of debt, but have a large surplus, out of which loans are made to planters, thus greatly assisting in the development of the country. Kuala Lumpur is the Federal capital.

POPULATION—IMPORTANCE OF MINING

The population of the four Federated States is now about 850,000, Europeans numbering 3,000 to 4,000, Chinese and Malays each about 350,000, and Indians 150,000. The currency of the colony is the Straits Settlements dollar, having a fixed value of 2s. 4d., or \$0.5677. The standard of weight is the picul, equal to 133½ pounds, which is divided into 100 catties.

The importance of the mining industry in the Federated Malay States is shown by the export returns for 1910. In that year the total exports amounted to \$58,111,380,¹ of which tin contributed \$32,368,851, or 55.5 per cent. of the whole; gold \$325,950, or 0.56 per cent.; and wolfram, \$26,781. Of the remainder, rubber constituted 26 per cent., leaving only about 18 per cent. for all other exports. In 1911 the value of tin produced rose to \$30,500,000, but as rubber also increased greatly the relative importance of the metals produced remained about the same as in 1910.

Gold Mining

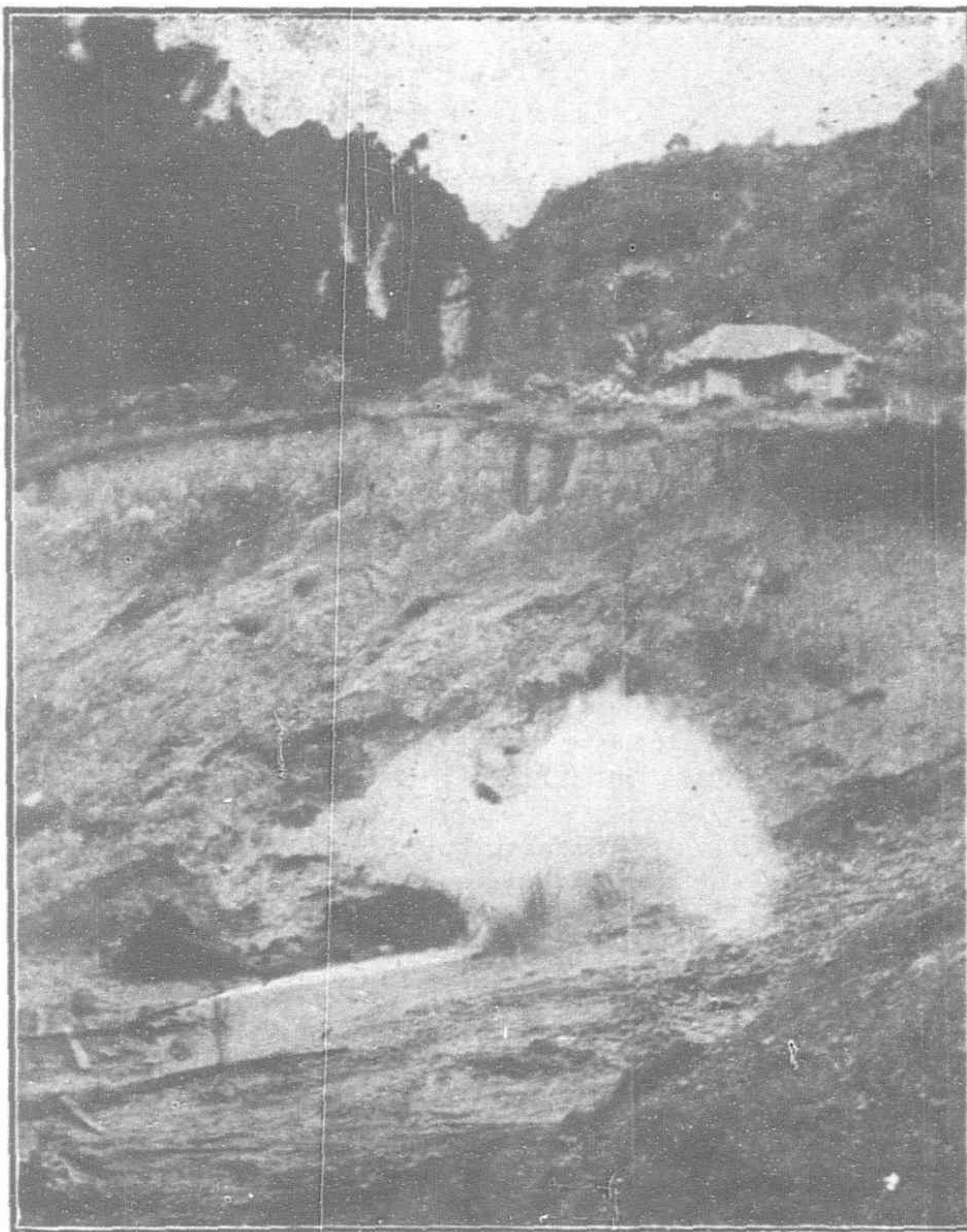
The production of gold in Perak in 1910 was 898.5 ounces, as compared with 1,278.8 ounces in 1909; Pahang, 15,868.5 ounces, against 14,887.7. Nigri Sembilan produced none in 1910 and only 76.9 ounces in 1909.

Nigri Sembilan having ceased to produce gold in paying quantities it is now mined in only two places, the Raub Australian Gold Mining Co., of Raub, Pahang, which in 1910 yielded 87 per cent. of the entire gold production of the colony, and in the alluvial workings of the Kuala Lipis district of the same State. The workings in Perak are on a very small scale, being principally in the hands of Chinese, who pan the river sands in several places. A large number of gold workings have been started at various times in Pahang, but

in almost every instance the returns have been too small to justify their continuation, and they have been abandoned. However, none of these workings was carried to a depth of more than 500 feet, and should the test shaft which is now being sunk at Raub disclose new veins of paying ore, many of the workings now idle would doubtless be reopened.

THE RAUB MINES

The Raub mines, which are near the town of Raub, in the State of Pahang, consist of three shafts, Bukit Malacca, Bukit Koman, and Anderson. The first named has a depth of about 700 feet, and is to be sunk to 1,000 feet in the hope of discovering richer quartz than has yet been found. The writer visited only the shallowest working, the Anderson shaft, which has a depth of about 250 feet, and is being developed on only one level. The gold-bearing quartz lies in irregular veins 1 to 3 feet thick, surrounded by a close-grained black rock. The method of working is to open the drifts about 6 feet wide and 12 feet high,



MINING IN THE FEDERATED MALAY STATES.—
Hydraulic Sluicing

taking out the lower strata of quartz first, and then erecting a staging 6 feet above the drift floor. Chutes are let in through this staging, and the refuse from the upper part of the drifts and from the stopes is dumped through these chutes until the lower half of the drift is refilled.

The labor underground is all Chinese and on a contract system, by which a Chinese contractor is paid at a fixed rate per ton for quartz delivered at the shaft bottom. The rate of payment could not be ascertained, but the contract is usually awarded to one of several bidders, and the rate varies with the nature of the workings and their distance from the shaft. In the Anderson shaft manual labor only is used for drilling and transporting ore and refuse, though a light railway with small trucks is provided. In the other shafts a few air drills are in use, but the tramming is done by hand.

PUMPS—MILL EQUIPMENT

The mine pumps are, with one exception, of the old Cornish design, having a huge walking beam at the shaft head, from one end of which the wooden pump rod descends to the mine sump and operates a plunger in a long cylinder, the plunger and rods being counter-balanced at the surface. However, the usual steam cylinder at the surface has been eliminated, and the beam is actuated by an electric motor through a lay shaft and flywheel coupled to the beam by a connecting rod. The dimensions of the pump at the Anderson shaft are: Cylinder diameter, 16 inches; stroke, 14 feet; pump rod, 270 feet long by 10 inches in diameter. With an 80-horsepower motor, and at six strokes per minute, the pump raises 450 gallons per minute. While this efficiency is not high the mine engineer argues that this style of pumping is thoroughly satisfactory since neither the pump nor the motor requires the repairs that would be necessary for a pumping outfit placed in the mind.

When the ore trucks reach the surface they are hauled by light locomotives to the upper floor of the mill, where the ore is dumped over grizzlies into hoppers, and then passes to the rotary crushers. The crushed ore passes by gravity through other hoppers to the stamps each in a single row. From the mortars, which contain amalgamated copper plates, the pulp flows through a screen upon the amalgamated apron plates, thence to a mercury trap, and, finally, over the concentrating tables. The crushers, stamps, and tables bear the name of a Melbourne, Australia, engineering company. The plant has a complete outfit of tanks, etc., for cyaniding the tailings, but this has been found unprofitable and has been discontinued.

POWER PLANT

Power is supplied from a hydroelectric station, which has been erected by the company in the mountains some 6 miles from the mines. In this plant 500 horsepower is generated, the current being transmitted as two-phase alternating, at 5,000 volts, which is transformed at the mine to direct current at 220 volts. All the motors and transformers are from the Oerlikon factory, at Winterthur, Switzerland; the dynamo at the power station is from the same makers, while the water turbine is from Escher, Wyss & Co., of Zurich. In addition to the water-generated power, boilers and engines totaling about 100 horsepower are maintained at the mine. These are in small portable units and serve principally as stand-bys in case of accident to the electric plant. About 300 horsepower is consumed in pumping the three shafts, the remainder being used for the mine hoists and mill machinery. There are two single-cylinder belt-driven air compressors, with cylinders 10 inches in diameter and 12-inch stroke, from the Sullivan Machinery Co., of Chicago. Both are driven by one 30-horsepower motor and 80 pounds air pressure is maintained. These compressors are running very nicely, but are said to be inadequate, since most of their output is consumed at present in driving a large reciprocating pump in one of the shafts, leaving insufficient power for air-drills. However, it is expected that the air-driven pump will soon be replaced by one of another type, possibly a centrifugal, which will permit the use of a greater number of air drills. In the Anderson shaft there is no electric lighting, and the writer is not informed on this point regarding the other shafts.

REPAIR SHOP—LABOR—OUTPUT

As the mine is about 15 miles from the nearest railway and 50 miles from the nearest commercial machine shop, it is compelled to

¹Values are in United States currency, unless otherwise stated.

maintain its own repair shop, which includes a small cupola, several forges, two or three lathes, and shapers and upright drills of various sizes. Almost without exception the machinists, as well as the workmen in the mill, are Malays. The total labor force of the mine is from 750 to 800 men, including the contract Chinese miners. Although exact figures are not available, the average rate of pay does not exceed \$0.45 per eight-hour day for Chinese and \$0.40 for Malays.

The output of the mine in 1910 was 14,555 ounces of gold, recovered from 55,137 tons of quartz crushed, an average of 0.264 ounce per ton. In 1909 the output was 14,510 ounces from 71,973 tons of quartz, an average of 0.2016 ounce per ton. From this it will be seen that, taking the value of gold at \$19.40 per ounce, the yield per ton of ore crushed was \$3.91 in 1909 and \$5.12 in 1910. Considering the low cost of power and labor in the Raub mines, the net profit of the workings should be fairly large, since several gold mines in the Black Hills of Dakota have earned satisfactory returns from quartz yielding only \$3.60 to \$4 per ton.

Tin Mining

Tin mining is of vastly greater importance in the Federated Malay States than all other classes of mining combined, because of the widespread occurrence of the ore and the high commercial value of the tin. In 1910 a total area of 280,254 acres of land was leased for tin-mining purpose from the Federated Malay States Government, which retains ownership of all mining lands and leases them at a nominal rental, subject to Government inspection and regulation. The production of tin in each State is shown by the following table, in tons of 2,000 pounds:

States.	1910 Tons.	1911 Tons.
Perak	28,089.01	29,155.93
Selangor	16,012.78	15,411.65
Nigri Sembilan	2,315.17	1,948.69
Pahang	2,711.59	2,930.28
Total	49,128.55	49,446.55

In 1910 the average value in Singapore was \$656.90 per ton, and in 1911 \$796.65

NATURE OF DEPOSITS—QUARTZ

The tin is usually found in the form of cassiterite, an impure stannic oxide (SnO_2), and was undoubtedly originally deposited in the metamorphic granite of the mountains and hills of this region. Lodes of the ore are found in many places in the granite in the form of an onyx quartz, and the working of this quartz has been frequently undertaken. However, the quartz workings have seldom been successful, since the profit derived from them compares very unfavorably with what can be earned from even the low-grade alluvial deposits. It is generally held by mining engineers of this district that quartz workings will not become numerous or profitable until all but the very lowest grades of alluvial deposits have been exhausted, which will probably not be for another 25 or 30 years. Moreover, should large alluvial deposits of tin ore be found in the recently acquired Provinces of Kedah, Kelantan, and Trengganu, where prospectors are already at work, the day of the quartz working will be further postponed.

On the other hand, there are a few quartz deposits so rich that thoroughly experienced miners are not hesitating to erect the expensive mills necessary for working them. One such plant is that of the Menglembu Lode Syndicate, near Ipoh, in which 20 stamps and 5 concentrating tables driven by gas engines produced 196.4 long tons of tin in 1910. Another mill is now being erected near Bentong, Pahang, by Messrs. Ruxton and Bibbey, both miners of much experience in the Federated Malay States and Australia. Moreover, the Government of the Federated Malay States has very recently agreed to a proposal of the Mine Owners' Association that reductions of not more than 50 per cent. of the export duty

on tin and tin ore shall be granted to miners who can show that the properties which they are working are of so low a grade that a reasonable profit cannot be earned if the full duty be exacted. As this measure will doubtless apply to mines in which the high cost of winning the tin leaves only a small margin of profit, it should have the effect of encouraging quartz mining.

ALLUVIAL DEPOSITS

The alluvial deposits of tin ore are very widely scattered, but the richest are usually found lying close to the slopes of hills or mountains, narrow valleys being most productive. This is easily explained on the theory that the disintegrated granite which contains the tin was washed down the slopes by rains and streams, and the tin ore, because of its weight, remained in pockets close under the slopes, while the sand that accompanied it was carried to a greater distance. That the streams in the valleys carried away the granitic sand and continuously deposited silt is shown by the fact that the richest ore is found in beds of clay. The famous and wonderfully rich Kinta Valley of Perak is an excellent example of the formation described and will for that reason receive special attention in this report. The valley is about 30 miles long, with an average width of 5 to 6 miles, and the hills on either side rise to an elevation of 300 to 400 feet. On the west side of the valley the granite of the hills slopes down until it meets the limestone floor, while on the east side of the valley the hills are flanked by cliffs of limestone outcrop. The Kinta, Sorakai, and several smaller streams flow through the valley. The richest ore deposits lie on the west side of the valley, but the east slope has what the west slope lacks—an abundant supply of water, by means of which the lower grades of ore can be profitably worked.

METHODS OF MINING

In times past a considerable amount of tin-bearing soil, or "karang" as it is called locally and will be designated hereafter in this report, has been raised by means of shafts, never exceeding 150 feet in depth and probably averaging not more than 50, and a certain amount is still so mined. But the opencast working has so rapidly superseded the shaft that the latter is now hard to find, except as old drifts are uncovered in mines that are now worked opencast. This is a natural outcome of the steadily increasing value of tin and the depletion of virgin karang. In 1895, when the price of tin was \$280 per long ton, only the richest karang could be profitably worked, and this was most cheaply reached by shafting. When the ore bed began to decrease in richness it was abandoned and new workings started. However, 10 years later, when the price of block tin reached \$850 per long ton, the mine owners realized the advantage of removing the overburden and carefully treating grades of karang that had been formerly despised. Moreover, virgin karang is now comparatively rare, and many mines are earning a good profit by reworking the dumps and tailings of old properties.

The following table shows the number of laborers employed in each class of tin mining in 1909 and 1910:

Class.	1909	1910
Opencast	137,156	122,686
Underground	18,198	19,154
Lampan	28,024	28,521
Unclassified	1,321	.....

Lampan mining may best be described as similar to the ground sluicing of the early California days, the method being to divert a portion of a small stream through a ground sluice, into which the karang is hoed and stirred by hand until the earth is washed away, leaving the ore in the bottom of the sluice. This method is confined to small surface workings, usually owned by Chinese who have too little capital to employ better methods. The remaining underground workings also are almost entirely Chinese mines, and many are worked without the aid of

machinery, the karang being raised by means of ladders or hand windlasses. However, to prevent a mistaken impression, it should be noted that, while a majority of the Chinese-owned properties are worked by rather crude methods, some of the best-equipped mines in the Federated Malay States are owned and operated by Chinese, and that, according to the figures of the Senior Warden of Mines, 78 per cent of the total output of tin in the year 1910 was produced from mines owned and operated by Chinese.

The methods by which the principal mines are worked may be classified as (1) opencast, (2) hydraulic, and (3) underground; and, for the purposes of this report, hydraulic mining will be subdivided into (1) natural power, and (2) generated power.

OPENCAST MINES

Opencast mines are by far the most numerous, since the class includes workings ranging from the tiny plots of "tributers," where one Chinese and his family pan out a few hundred pounds of ore in a year, up to the great Tronoh and Tambun mines, which hold the records for production. Needless to say, the amount of machinery used varies with the size and richness of the mine, but as even the largest employs no great plant, we may at once pass over the smaller ones and proceed to a consideration of typical mines and mills of major importance. The main difference in the larger opencast mines lies in the amount of power used and in the machinery for developing such power. The method and apparatus for treating the karang are practically the same in all mines. Therefore, before considering the subject of power and power plants, a description will be given of the typical ore mill which is to be found at every opencast or underground mine of considerable size.

ORE MILLS

In almost every case the karang is raised to the mill by means of small trams, which are hauled up inclines by winding engines. In the mill the karang is dumped upon grizzlies, and the clods are broken up by hand until the earth passes through, falling directly into the puddlers, which are circular tanks of wood or concrete, about 15 feet in diameter and 6 feet deep, with an inlet for fresh water, and an overflow pipe with screen set about 2 feet above the bottom of the tank. In the puddlers the karang is agitated by two or more harrows or "drags," suspended from four arms which rotate upon a vertical shaft set in the center of the tank. These vertical shafts are driven through bevel gears by a main shaft which passes close over the row of puddlers, a clutch permitting each puddler to be cut out for cleaning. A carefully regulated supply of fresh water being pumped into the puddlers, there is an equal overflow of slime, which passes through open troughs to the riffles.

The riffles consist of wooden troughs 4 to 6 feet wide, about 12 inches deep, and from 50 to 80 feet long, the incline being 1 in 25 to 1 in 30, depending upon the fineness of the ore which the mine is producing. At intervals of about 4 feet cleats are nailed to the sides of the trough, in which bars of hardwood are laid. These bars are usually 2 inches square in cross section, and as the deposit behind them gradually rises one bar is placed above another until the riffle is filled and has to be cleaned. Several riffle boxes are usually placed side by side under a thatched roof, and coolies pass up and down agitating the deposits with a kind of two-pronged hoe. It has been found that fully 90 per cent. of the ore in the karang is recovered in the riffles, in addition to which a small amount is often recovered from the tailings by tributers, a class of labor that will be described later.

When the riffles become filled, which may be once a week or once a month, depending upon the amount of karang treated, the supply of slime is cut off, the crossbars removed, and the deposit raked out. As it comes from the riffles the ore still contains a varying proportion of sand and other impurities, which are

removed by hand washing in pans, No. 60 being the usual mesh of the screen. This washing is done by coolies over coffin-shaped boxes with a small flow of clean water, several traps being provided to catch the finest particles before the water is finally wasted.

In most alluvial mines small amounts of ore are occasionally found inclosed in quartz pebbles, which remain in the puddlers and must be crushed before further treatment. For this purpose some of the large mines maintain a small battery of four or five stamps of the gravity type, but the crushing is more commonly done in a kind of mortar (introduced by the Chinese) in which the crushing shoe is hung at the end of a beam, which rests on a fulcrum and is actuated by the foot power of coolies. From the stamp the crushed material goes to the washing pans.

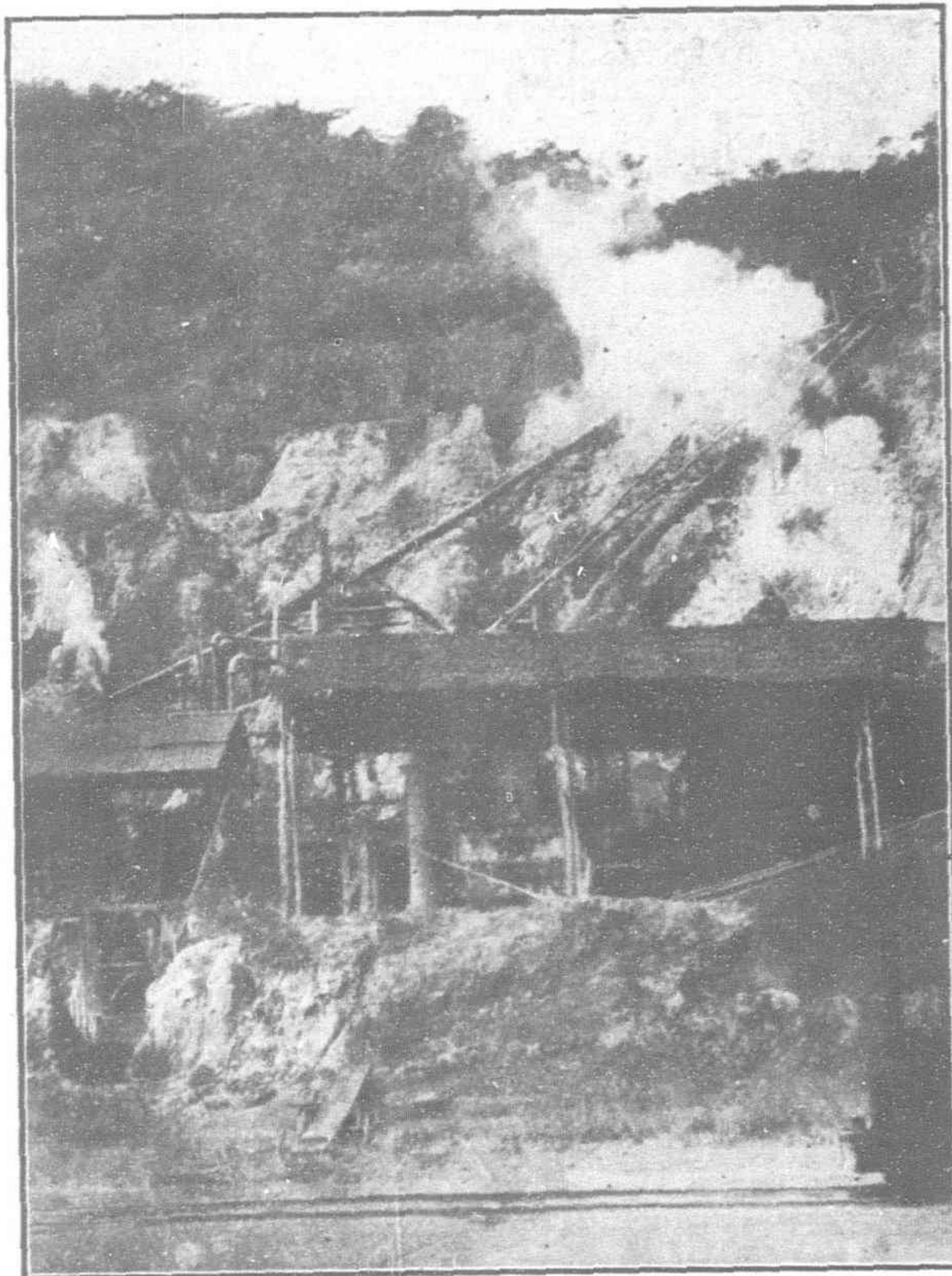
The clean ore is dried in a perforated cylinder placed around a cone-shaped stove, which may be fired with coal, wood, or charcoal. If the ore is known to contain any considerable amount of wolfram this is then removed by ordinary horseshoe magnets, which are passed over thinly spread layers of the ore and finally the ore is sacked, 1 picul (133½ pounds) to a sack, and stored until shipped to the smelter.

POWER SUPPLY

Power is required for (1) drainage pumps and fresh-water supply pumps; (2) moving karang and overburden in the mine and to the mill; (3) mill operation, such as driving puddlers, stamps, etc., and dynamos; the latter usually lighting only, since practically no motors are now in use in the opencast mines.

In the small mines many of these services are performed by man power, as, for example, the operation of the Chinese type of stamps already described, or the transportation of the karang to the mill on the backs or heads of coolies. Moreover, many Chinese pumps are still seen in operation, both for drainage and to supply water to puddlers and riffles. Because of their widespread use, these Chinese pumps deserve description. They consist of an endless chain of wooden floats strung about a foot apart upon two ropes. The floats fit snugly in a long, inclined wooden trough, which rises from the sump to the surface at an angle of 30° to 45°. At the surface the floats pass over a large wooden drum and empty into a discharge trough. The staves of the drum, which is 6 to 12 feet in diameter, are spaced 1 to 2 feet apart and, upon the outside of this endless ladder, one or more coolies climb like squirrels in a revolving cage, turning the drum by their weight. As the maximum lift of such a pump is only about 30 feet it becomes necessary, when the water must be carried to a greater height, to place them in stages, one pumping to another. Even with the low wages that prevail in the Federated Malay States this method of pumping is recognized as expensive, and power pumps are rapidly displacing these antiquated devices.

Ten years ago the best-equipped mines generated all their power in small steam units, one for the drainage pumps, one for the supply pumps, one for each winding engine, and one for the mill; and even to-day a majority of the larger mines are so equipped. But with the rapidly increasing cost of wood for fuel the gas producer and gas engine came into use and they are now to be found in most of the up-to-date mines. The cost of this power varies with the cost of coal, which, since none has yet been mined in the Federated Malay States, must all be imported. A few plants are run upon Welsh anthracite, which costs laid down in Ipoh



MINING IN THE FEDERATED MALAY STATES.—
A Power Installation

\$16 to \$17 per ton; others use semianthracite "Hongay" from China, costing \$11 to \$12 per ton. A majority use, both in producers and under boilers, the very poor Bengal or Borneo coals, which can be had at \$5.50 to \$6.50 per ton delivered in Ipoh.

SMALL UNIT INSTALLATIONS—OIL AS SOURCE OF POWER

It is surprising, however, to note that even when the producer and gas engine are employed they are generally in small units and are largely supplemented by steam power. Since the power in any mine must be widely distributed, it would seem that the economy of central electric stations and motor-driven pumps and machinery would be quite apparent, and the arguments of the mine owners against them are of interest. They say that, in the first place, the richness of a given mine or tract of land cannot be ascertained in advance,



MINING IN THE FEDERATED MALAY STATES.—Open Face Working

as the karang does not run in well-defined veins, and test borings are of little value. Therefore, even if the first workings disclose rich earth, no one can foretell how soon it will be exhausted or what the life of the mine will be. For this reason owners decline to risk the initial expense of central power stations. The total cost of the small units required under present methods may be as much as that of a central power station with the necessary motors; but it is argued that these small units can be purchased from time to time as the mine justifies the expense, and that when the mine is exhausted they can be readily sold or transferred to other workings.

Another argument against the large electric plant is that the Chinese and Malay engineers who operate the small steam and gas plants (and these only indifferently well) would not be competent to keep in order a large electrical installation. Moreover, the great fluctuations that have occurred in the price of tin must be considered, as many mines making a fair profit at present prices would have to close down should the price of tin drop 25 per cent.

In spite of all these objections, the writer believes that the central electric station, generating from 200 horsepower upward, will be the next feature of opencast mine improvement in the Federated Malay States. It may also be confidently predicted that oil will soon become the chief source of power in the mining district, as it is fast becoming in the rubber-growing fields. When one considers that the enormous oil fields of Sumatra, Java, and Borneo are within 300 miles of Ipoh, he is amazed to find that in 1910 only 6 tons of fuel oil were imported into the whole State of Perak. In the same year Selangor, the principal rubber-producing State, imported 1,545 tons and Pahang, where wood fuel is still cheap, 1,801 tons.

TYPES OF BOILERS AND ENGINES IN USE

Of the small power units generally in use the boilers are almost invariably of the portable type, 20 to 50 horsepower, and carrying 50 to 80 pounds working pressure. These supply steam to the winding engines, the mill engines, and in many cases to reciprocating steam pumps for drainage or riffle supply; but for pumping service the combined portable boiler and engine, driving a centrifugal pump, is largely employed. The centrifugal pumps range from 2-inch to 6-inch, depending upon the quantity of water to be handled, and are always single stage, as the discharge head never exceeds 175 feet.

The winding engines are usually of the horizontal duplex type, cylinders 6 by 10 inches to 10 by 18 inches, with drum 3 to 5 feet in diameter. The steam engines used for driving the mills are, of course, of many different makes and sizes, but with very rare exceptions they are simple, slide-valve, non-condensing engines, generating 30 to 60 horsepower.

As has been mentioned, the best equipped mines are now driving their mills (but seldom their pumps and winding engines) from producer-gas engines. All the producers and engines that the writer has seen in the mines visited are from three makers—Fielding & Platt, of Gloucester; the Hornsby-Stockport Co.; and Ruston, Proctor & Co.—all English makers. The producers are of the suction type, with wet and dry scrubbers, and most of the engines are of the single-cylinder four-cycle design, generating 30 to 60 brake horsepower. The units are frequently installed in duplicate to provide against breakdowns and to permit of alternate cleaning in mines that operate continuously. Mine

managers speak highly of these outfits, and the Chinese and Malay engineers appears to run them with little difficulty and few accidents. The writer saw no oil engines at any of the mines visited, though informed that in the Kuantan mine, in Pahang, Diesel engines, aggregating 245 horsepower, are in use and are proving very satisfactory. To illustrate the above general description, detailed accounts follow of two well-known opencast mines.

THE TAMBUN MINE

The Tambun is often called the "show mine" of Perak, because its owner, Towkay Leong Fee, not only welcomes visitors, but keeps his property in such perfect order that one might almost think it was maintained purely for their benefit. That such is not the case is proved by the fact that the Tambun has held (and probably still holds) the record for a year's production, its output in 1907 or 1908 having been 3,600 long tons of ore. At present the owner is voluntarily curtailing production by working his mine on a nominal eight-hour day, whereas most other mines are running continuously day and night. While leaving the question of labor for later discussion, it may be said that in most opencast mines the karang and overburden are raised from the mine either by contract or by piecework. In the Tambun mine the raising of 80 trucks of spoil for each man in a gang constitutes an eight-hour day for Chinese laborers, and for this amount each is paid \$0.33. If by rapid work or by working overtime the gang exceeds the average of 80 trucks per man, the pay is increased pro rata. This explains why the tram pushers in the Tambun are usually seen moving at a run. About 700 Chinese are employed and 200 Indians; the latter all Tamils and Punjabees. As the Indian does not equal the Chinese as a workman his pay is proportionately less, being \$0.255 per eight-hour day.

EQUIPMENT OF TAMBUN MINE

For raising spoil there is a light railway and trams, but no locomotives; three inclines, two of which are employed for the removal of overburden, each with double tracks; and three winding engines with continuous steel cables, so that descending empties partially counter-balance loaded trams ascending. These winding engines, from Ransomes, Sims & Jeffries, of Ipswich, England, are simple duplex, with cylinders 10 by 18 inches. They are supplied with steam at 60 pounds pressure, from four portable boilers built by the Wantage Engineering Co., Wantage, England.

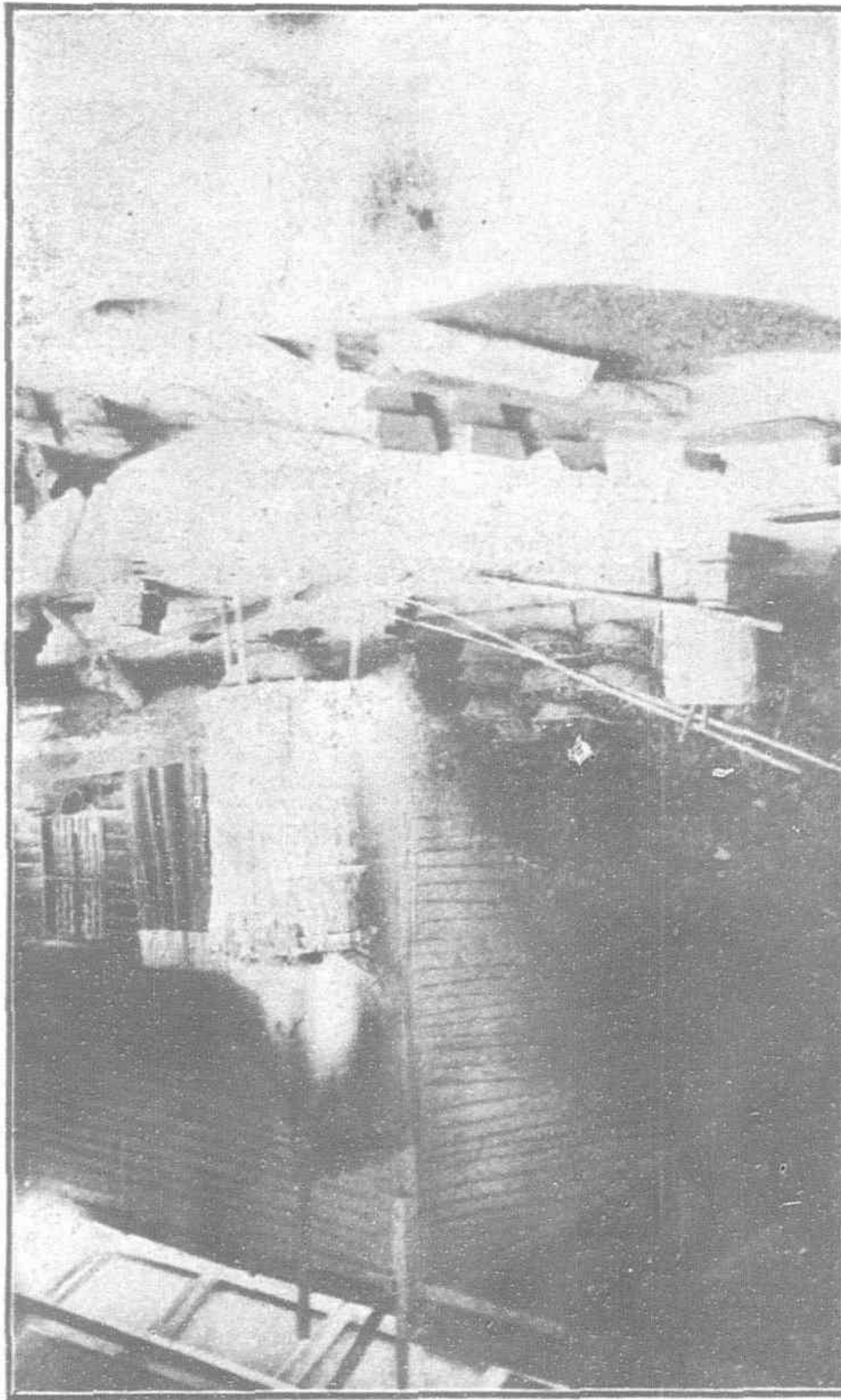
The drainage pumps are one 8-inch and two 6-inch centrifugals, driven by portable combined boilers and engines from Ransomes, Sims and Jeffries, and pumping against a total head (suction and discharge) of about 60 feet. The fresh water service for puddlers, raffles, etc., is maintained by a very neat little pumping station, in which power is generated by a 35-horsepower single-cylinder four-cycle gas engine, supplied by two suction producers which are operated alternately. Engines and producers are from the shops of Fielding and Platt. The impellers of both pumps, which are 6-inch centrifugals from Gwynnes (Ltd.), of Birmingham, are mounted upon the same shaft, each with a clutch, so that they can be run singly or in pairs. They are pumping against 35 pounds head. The mill contains four primary and six secondary puddlers constructed of concrete. This is the only mill the writer has seen in which puddling is done in two stages. The arms of the puddlers are driven through the usual shaft and bevel gears by two producer-gas engine sets of 35-horsepower each, duplicates of the set in the pumping station, and from the same makers. When all the puddlers are in use both engines are required. As lighting for night work is not needed, no dynamo is operated.

Since the Tambun has its own smelter, a small mill for coarse concentration is maintained. This consists of one 5-foot Huntingdon mill, manufactured by Davey, Paxman & Co., of Colchester, England; a set of four standard revolving trommels (pitch 1 inch to 1 foot); and four four-compartment Hartz jigs, each

taking the feed from one trommel. There is also a small concentrating table of the Overstrom type; the whole mill is driven by a small steam engine.

CHINESE SMELTER

The smelting plant is of a simple Chinese type, but gives very satisfactory results. Five furnaces are in use, charcoal being used as fuel and a small amount of limestone as a flux. The blast for each furnace is maintained by a coolie, who pushes and pulls a square, single-acting piston in a wooden box 5 to 6 feet long. The intermittance of this blast does not seem to be detrimental to the smelting process; indeed, the results were not so good when a rotary blower was installed a short time ago. The Chinese attributed the unsatisfactory working of the mechanical blower (which was probably due to mishandling for the purpose of securing the reemployment of the dismissed blower coolies) to the fact that the supply from the rotary fan was not the same kind of air as that derived from the hand-power blowers. The slag trickles down into an iron receptacle, where the scum is removed by a strainer and



MINING IN THE FEDERATED MALAY STATES.—A Typical Chinese Smelting Furnace for Tin Ore

returned to the furnace; the clean molten tin is then ladled into the molds. Although the Tambun is the only mine the writer has seen that smelts its own ore, there are many small Chinese smelters scattered about Perak, which somehow manage to run in competition with two large well-equipped, European-style smelters in Singapore and Penang.

In 1910 there were removed from the Tambun mine 684,730 trucks of overburden and 250,703 trucks of karang, from which 621 long tons of ore were recovered.

THE LAHAT MINE

The Lahat mine resembles in general features the Tambun, except that the workings are long and narrow, for which reason the company has installed two small locomotives for moving karang and overburden in the mine; the spoil is raised to the surface on the usual incline by a steam winding engine. There being an insufficient supply of fresh water for the puddlers and raffles, it has been found necessary to pump the drainage water into shallow ponds, from which, after the mud has settled, it is pumped to the mill and raffles. When this supply is not

sufficient, as sometimes occurs when the rainfall is below normal, the water from the raffles must be likewise impounded and used again after the tailings have settled out. The drainage pump is a large duplex affair fed by a portable boiler. Coal for this boiler is handled on an aerial ropeway.

The puddlers, raffles, and washing sluices are similar to those already described. The power plant is equipped with a steam engine and boiler, and with a 120-horsepower duplex four-cycle gas engine, running at 200 revolutions per minute, which, with two producer outfits of 160 nominal horsepower each, are from Fielding and Platt (Ltd.). The producers, which are run on Welsh anthracite, are operated alternately, and the steam plant is reserved as a stand-by. As the mill is run continuously, an ingenious arrangement has been made for quickly cutting in the steam engine in case of trouble with the gas engine or plant. By this arrangement the crank shaft of the steam engine is used as a lay shaft, the gas engine being belted to a pulley on one end, while the main belt to the mill runs on a pulley at the other end. This device has been found very convenient, though a small amount of power is wasted in keeping the steam engine's piston and connecting rod in motion when steam is not up.

In addition to furnishing power for the puddlers, which absorb 10 to 15 horsepower each, the plant drives a 5-horsepower dynamo for lighting and also two centrifugal pumps that supply the puddlers and raffles. These pumps, which are from Gwynnes (Ltd.) have a capacity of 1,250 gallons per minute each, and their impellers are mounted on the same shaft, each with a friction clutch.

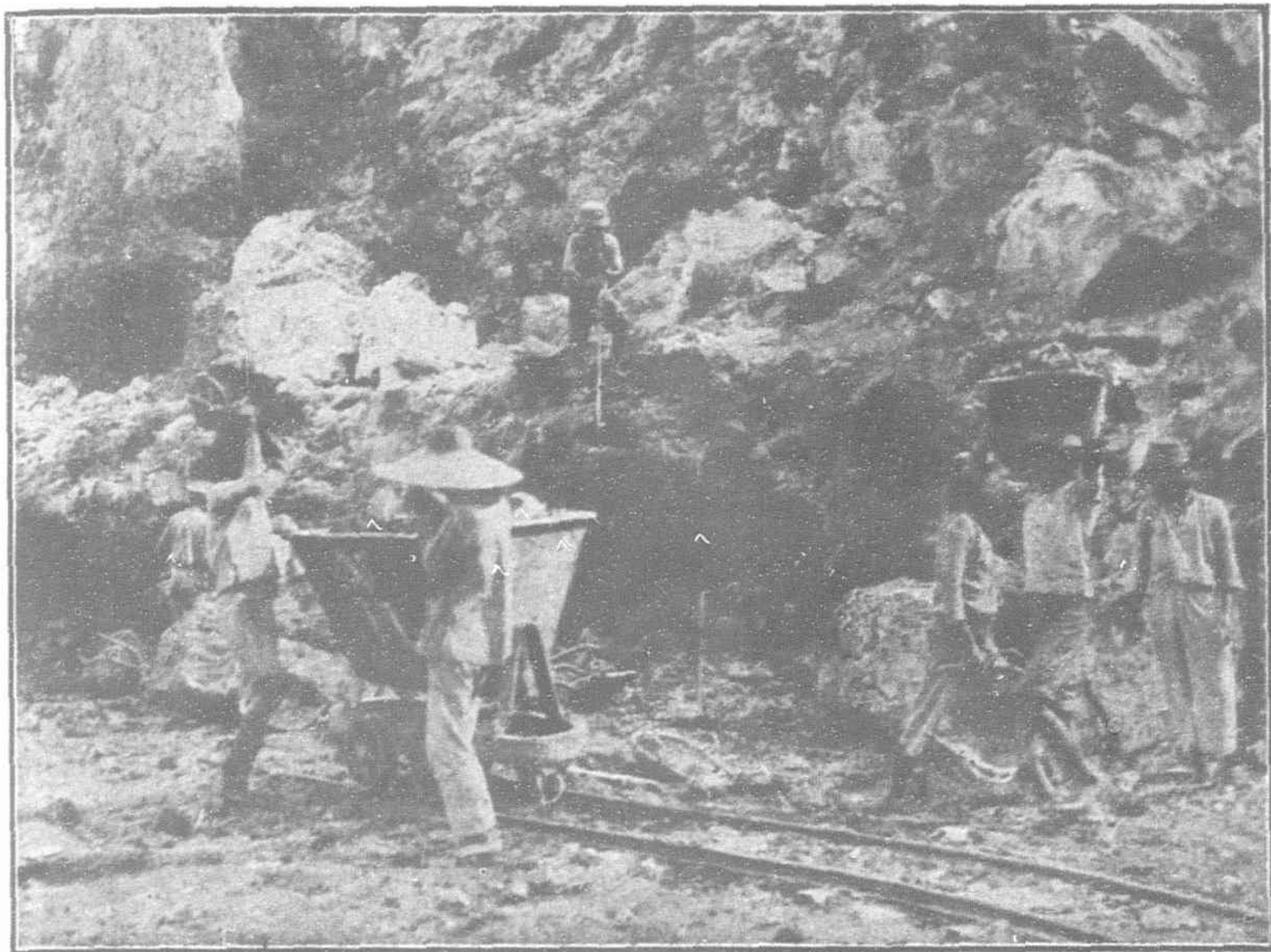
OUTPUT OF LAHAT MINE—LABOR

In 1910, 298,000 cubic yards of spoil were raised from this mine, of which 65,000 cubic yards were overburden, and 548 long tons of ore were recovered. The Lahat ore averages 74 per cent. pure tin, which is rather higher than the average for the whole mining district. At the present time about 700 men are employed and 22,000 cubic yards per month are being raised, from which 36 to 38 long tons of ore are secured. The spoil is moved by contract with Chinese and Tamil foremen, the former receiving 7.9 cents and the latter 6.8 cents per truck of 20 cubic feet delivered in the mill. The difference in rate of pay is due to the fact that the company supplies the Tamils, but not the Chinese, with tools, and also that the compulsory contribution of the company to the Tamil immigration fund, described later, amounts to a charge of about 1.1 cents per cubic yard. The Chinese work 8 hours per day, 4 on and 8 off, while the Tamils work one shift of 6 hours in the 24 and have their time so arranged that once in each week they have a whole day free.

Before leaving the subject of opencast mines, it should be mentioned that the omission of a description of the most famous opencast mine in the Federated Malay States—the Tronoh—is not due to an oversight, but to the fact that permission to visit these workings was conditioned on a promise that a detailed description of the plant should not be published. The mine was formerly worked by means of shafting, but the overburden has now been removed and the workings are all opencast. Nearly 6,000 men are employed, and in 1911 the Tronoh broke all records by a production of 2,083 long tons of ore in four months.

NATURAL-POWER HYDRAULIC MINES.

Natural-power hydraulic mines are found in almost every section where a good supply of water can be secured under a gravity head of 100 feet or more, since by this method very low grades of tin-bearing earth can be profitably treated. There are included in this class the Tekka, Old Gopeng, New Gopeng, Kinta Association, and Kinta Limited, in Perak; the Serendah, in Selangor; and the Kenaboi and Seremban, in Nigri Sembilan. However, as the method of working and the plant employed are almost identical in every mine of this class a description of one will answer for all.



MINING IN THE FEDERATED MALAY STATES.—Open Face Mining

and for this purpose the Tekka, the largest and best known, affords an excellent illustration.

The Tekka lies on the east side of the Kinta Valley, where the limestone substratum is pushed up into cliffs. The water supply is brought from the hills, under a pressure of 65 pounds to the square inch, and is distributed to the monitors through 10-inch riveted steel piping which has been tested to a pressure of 100 pounds per square inch. As these pipes are made in 20-foot lengths and are joined only by a taper joint, they are easily shifted. The monitors consist merely of steel pipes 6 to 8 feet in length and 4 to 6 inches in diameter, with a swivel joint and mounted on a wooden stand, the nozzle usually being 2 inches in diameter. There are now eight monitors in operation in the Tekka mine, utilizing a total of about 1,500 cubic feet (11,200 gallons) of water per minute.

The monitors cut down the tin-bearing earth and blow it up to the elevators through trenches prepared for that purpose. In the Tekka and most other mines of this class the deposit in these trenches is given a preliminary washing by hand, a large amount of ore being quickly and easily secured in this way. This washing is done principally by women, in slightly dished wooden trays, the drainage from the monitors being used for the washing. It should be noted here that in hydraulic mines no distinction is made between karang and overburden, as all the earth removed by the monitors is treated equally.

HYDRAULIC ELEVATORS—COST OF PRODUCTION

The hydraulic elevators, of which there are two at Tekka, are for the purpose of raising the earth to the riffles, which must be sufficiently elevated to allow for the proper disposal of the tailings. These elevators are installed at the lowest levels in the workings, and a pit, or sump, is dug to receive the earth blown up by the monitors. The principle of the elevator is, of course, very simple, the earth being drawn up from the sump by suction, and carried to the top by the pressure of the injection water. As the injection water is under a pressure of about 65 pounds to the square inch, and the resulting erosion is considerable, the elevator pipes are made of cast steel, flanged and bolted. The height of the elevator depends principally upon the level of the ground on which the tailings are to be

deposited, 30 to 50 feet being the usual elevation. While the mechanical efficiency of the hydraulic elevator is very low, this is of small importance, since the amount of water needed to wash a given quantity of earth in the riffles is almost the same as that required to raise the same quantity of earth through the elevator. The water is thus made to do the double duty of first raising and then washing the karang.

The riffles at the Tekka and other hydraulic mines are of exactly the same

den not included, \$0.485; Tambun (opencast), \$0.34 per cubic yard; Tekka (hydraulic), \$0.07 per cubic yard.

Aside from a few coolies engaged in hand tramping, labor in the Tekka mine is paid by time; the Chinese receive \$0.335 to \$0.36 and Tamils \$0.205 per eight-hour day. In 1910, 438 long tons of ore were recovered.

Generated-Power Hydraulic Mines

Generated-power hydraulic mines resemble those of natural-power hydraulic mines in that the tin-bearing earth is cut down and blown to a central sump by monitors; but the water pressure must be generated by pumps and the earth raised to the riffles by gravel pumps, instead of by the hydraulic elevators used in the natural-power mines. The largest and most modern of the generated-power hydraulic mines is the Pengkalen, which is situated in the Kinta Valley, near Ipoh.

Its central electric station is equipped with three 400-horsepower Babcock & Wilcox water-tube boilers and two Bellis & Morcom's high-speed vertical compound condensing engines, each direct coupled to a 500-kilowatt dynamo from Crompton & Co., of Chelmsford, England, generating three-phase alternating current at 2,200 volts. Both Australian and Natal (South Africa) coals are used under the boilers. To increase the capacity of the plant, orders have recently been placed for a fourth boiler of 400 horsepower, automatic chain stokers for the whole battery of boilers, and a mixed pressure turbo-generator set of 600 kilowatts from Fraser & Chalmers (Ltd.). The pumping station which supplies the monitors contains two single-stage 12-inch Worthington centrifugal pumps, each direct coupled to a 280-horsepower motor and having a capacity, at 740 revolutions per minute, of 3,000 gallons per minute at a pressure of 65 pounds per square inch. Six monitors with 2-inch nozzles are now in use, and the number will be increased as soon as the new power machinery is installed.

GRAVEL AND DRAINAGE PUMPS.

The third and most interesting division of the works are the gravel pumps, of which there are three in different parts of the workings.

MINING IN THE FEDERATED MALAY STATES.—Monitor at Pangkalen
Mine blowing Earth towards the Intake of the Gravel Pump

design and construction as those described for opencast mines, except that they are usually somewhat longer, since the karang, which the elevator discharges directly into the riffles, lacks the thorough preliminary sliming that a puddler provides. The final washing, drying, extraction of wolfram, packing, and smelting of the ore are the same in hydraulic as in opencast mines.

The low cost of working a hydraulic mine is best illustrated by a comparison of the Tekka with the Lahat mine. In the latter 700 men and 300 horsepower of prime movers (not to mention two locomotives) in 12 months raised 298,000 cubic yards of earth, of which 232,811 cubic yards were treated. In the Tekka mine only 300 men and no fuel-generated power were required to raise and treat an estimated quantity of 840,000 cubic yards in the same period. Estimates by the mine managers of the cost of raising and treating the tin-bearing earth in three different mines are as follows: Lahat (opencast), \$0.52 per cubic yard (overbur-



MINING IN THE FEDERATED MALAY STATES.—Haulage incline at Tambun Mine; mill at top. The trams in foreground have capacity of 20 cubic feet each

Each is placed upon a steel barge so that when the mine face becomes too distant the pumps can be moved to a new position by simply flooding one section of the mine and floating the barge to the desired point. However, as each movement of the barge necessitates changing the piping, and often the location of the riffles as well, a barge is usually shifted not more than once or twice in a year. The illustration shows one of these barges, covered over with corrugated-iron sheets. The pipe seen in the foreground is the intake of the gravel pump, while the discharge pipe, leading to the elevated riffles, is shown upon the right, carried upon bamboo scaffolding. The total suction and discharge head is about 60 feet.

The Pengkalen gravel pumps, which are from the Australian Otis Engineering Co., of Melbourne, are 15 inches in diameter, with three-wing rotors 36 inches across. Notwithstanding that both rotors and liners are of cast steel (the former with cast-iron shoes) the erosion is so rapid that the life of a liner is usually not more than three months. The gravel pump is driven by a 12-strand wire-rope drive from a 350-horsepower motor, which is of Messrs. Cromptons' manufacture, as are all other motors in this mine. The suction and delivery pipes of the gravel pumps are 12 inches in diameter, of welded steel, flanged and bolted; the supply pipes for the monitors are the 10-inch riveted steel pipes with taper joints previously described.

The fourth division of the Pengkalen plant includes the drainage pumps, of which there are two, one 12-inch centrifugal with 85-horsepower motor and one 7-inch centrifugal with 20-horsepower motor. Another motor of 35 horsepower drives a 220-volt direct-current dynamo for lighting.

OUTPUT AND COST OF PRODUCTION.

In the Pengkalen mine 776,000 cubic yards of earth were treated in 1910 for a return of 392 long tons of ore, but recently the working time has been shortened and the average treated is now about 30,000 cubic yards per month of 25 working days. Only 50 laborers are employed, most of them Chinese, who receive \$0.40 per eight-hour day.

The estimated cost of raising and treating the earth in this mine is about \$0.315 per cubic yard, nearly five times as much as in the Tekka natural-power hydraulic mine. This great difference, which is due to the high cost of steam-generated power as compared with natural hydraulic power, makes such plants as the Pengkalen out of the question on low-grade ground. It seems quite probable that lower costs might be attained in generated-power hydraulic mines by the use of producer-gas engines, or, even better, oil engines of the Diesel or similar type. The Sungei Raia Co., of Perak, is operating a hydraulic plant driven by producer-gas engines using Chinese coal, but information regarding their costs is not at hand. So far as the writer can learn, there are at present no generated-power hydraulic plants in the Federated Malay States driven by oil engines.

The foregoing constitute the established methods of tin mining in the Federated Malay States. It is reported that a French company has placed an order for a steam dredge of the ordinary bucket type, to be used in Perak for tin dredging, but local engineers are skeptical as to the feasibility of this method, and it is not likely to be extended until the first dredge has had time to prove itself.

Smelting

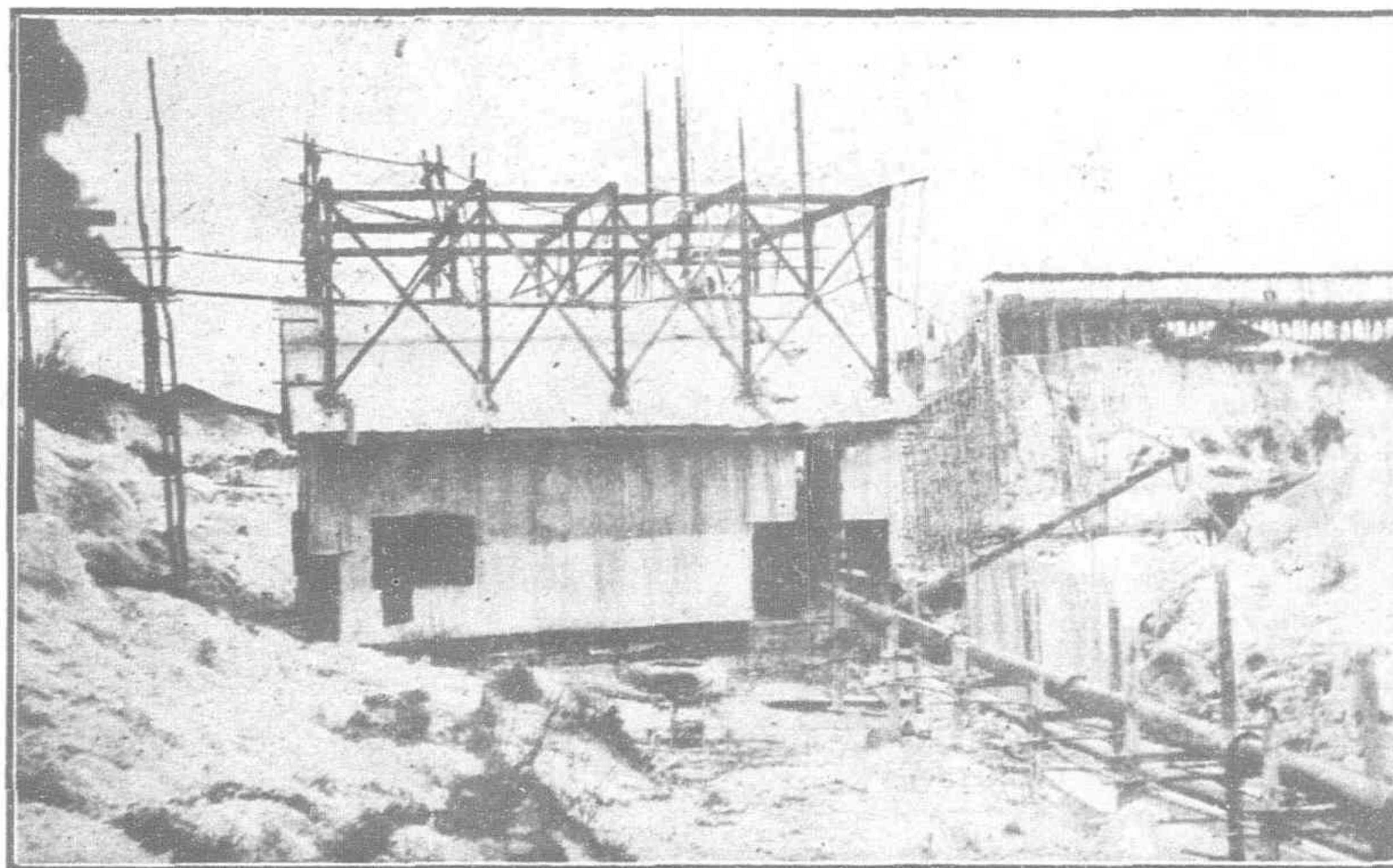
The two plants which smelt most of the tin ore produced in the Federated Malay States are situated in the Straits Settlements, one in Singapore and the other near Penang. There is also a small European-owned smelter in Ipoh, but owing to the noxious fumes given

off its operation has been discontinued. Therefore, it may be assumed that all the block tin exported from the Federated Malay States is the output of Chinese smelters, similar to the one described in connection with the Tambun mine. This output of block tin is shown by the following figures from the reports of the Senior Warden of Mines:

Years.	Total export ore and block.	Block tin.	Proportion of block to total.
	Long tons.	Long tons.	Per cent.
1909.....	48,743.3	10,749.1	22.05
1910.....	43,865.0	9,780.7	22.29
1911.....	44,148.5	9,846.5	22.30

The total export figures represent 70 per cent. of the gross weight of the tin ore, which is the proportion of pure tin to tin ore fixed by the Federated Malay States Government for taxation purposes.

It is said that over 80 per cent. of the tin ore exported from the Federated Malay States is smelted either in the smelter of the Straits Trading Co. at Singapore or that of the Eastern Smelting Co. at Penang; these smelters also received a small amount of ore from Australia and South Africa. Such of the Federated Malay States ore as is not smelted in the Straits Settlements goes to England, the following provision of the customs tariff making it impossible to ship the ore to other countries for smelting: "Export duty, tin ore, 70 per



MINING IN THE FEDERATED MALAY STATES.—Barge carrying Gravel Sand at Pengkalen Mine; Riffles to the Right

cent. of the duty on tin with, in the case of tin ore exported otherwise than under such guarantees as the Resident may require that it shall be smelted in the Straits Settlements or United Kingdom, an additional duty of Straits \$30 per picul (\$285 United States currency per long ton)."

The export duty on block tin, provided by the same tariff, is Straits \$10 per bhara (400 pounds) when the price of tin does not exceed Straits \$41 per picul; but when the price exceeds \$41 per picul the duty per bhara is increased by \$0.50 for every \$1 by which the price of tin exceeds \$41 per picul. At the present (Feb. 22, 1912) price of Straits \$96.50 per picul in Singapore, the export duty amounts to Straits \$38 per bhara, or \$109.25 United States currency per ton of 2,000 pounds. In 1910 this duty alone yielded the very handsome revenue of \$4,002,668 United States Currency.

CHARGES FOR SMELTING

The smelting companies buy the ore outright from the producers, after the quality has been determined by assays made at the mine by the smelter's assayer. The charge for smelting can, therefore, be quite accurately estimated from the difference between the price which the miner receives for his ore and the market price of block tin on the same date, the percentage of tin in the ore being known. The managers of four mines gave the following as their charges for smelting, the term being used in the sense explained above:

Mines.	Charge per picul. Straits dollars.	Charge per short ton.
A.....	2.37	\$20.11
B.....	2.16	18.19
C.....	2.32	19.66
D.....	2.24	18.98
Average.....	2.27	19.23

The difference in the charge for different mines is partially explained by the fact that the price paid the owner is usually for the ore delivered at the nearest railway station, the smelting company paying freight charges to the smelter. The published railway tariff for tin ore is one-half cent Straits currency per mile per picul for the first 50 miles, and one quarter cent per picul-mile for each subsequent mile up to 150, after which it becomes one-eighth cent per picul-mile for each subsequent mile. Therefore mine A, which is, say 122 miles from Penang, will find its smelting charges 1 cent per picul higher than mine B, which is, say, only 82 miles from Penang. Assuming the distance from Ipoh to Penang (112 miles) to be the average distance the ore has to be shipped to the smelter, then the smelting company's gross profit is at once reduced by 40½ cents Straits currency (plus wharfage charges at Prai) per picul, leaving \$1.80 to \$1.90 Straits currency for the actual cost of smelting, marketing, and profit. At the present price of tin, \$96.50 Straits per picul, this net charge amounts to 1.8 to 2 per cent. of the market price of block tin.

Labor Conditions

The total labor force in the Federated Malay States tin mines in 1910 was 170,361, a decrease of 14,340 as compared with 1909. In 1911, however, the labor force totaled 196,300, a considerable increase over any previous year. In addition to the number given, 10,257 women and children worked in the mines in 1910 under "dulang" passes issued by the Government, but as their employment is not continuous they are not included in the regular labor force. The number employed under various systems in 1910 was as follows: Contract, 47,480; wages, 22,921; tribute, 99,960; dulang, 10,257.

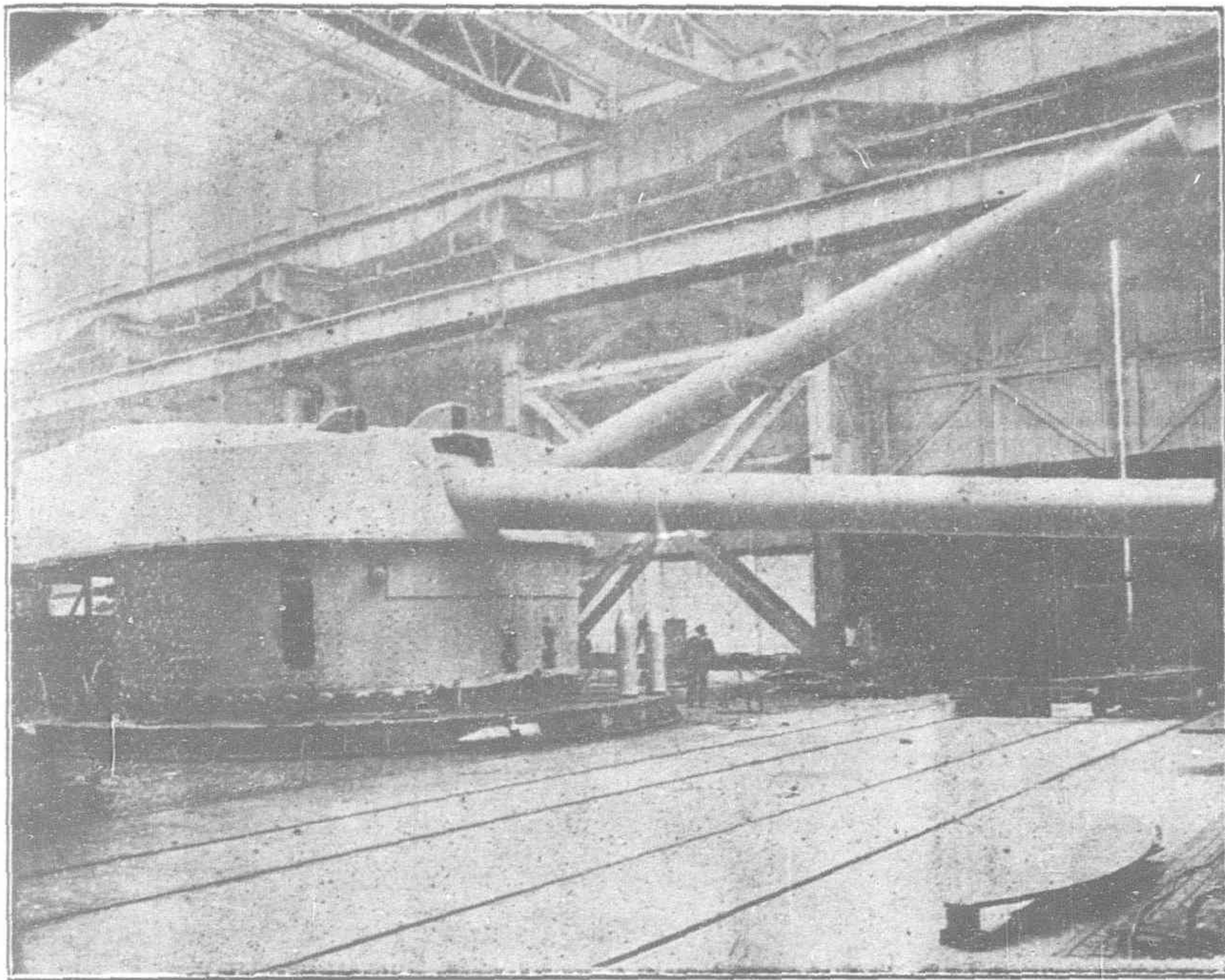
Under the contract system the laborers receive, either direct from the mine manager or from the Chinese foreman who employs them, a fixed amount for each truck of karang or overburden raised from the mine, as in the case of the Tambun and Lahat mines. This system has been found much more satisfactory for mine coolies than a fixed daily wage, since it prevents "soldiering." On the other hand, it is obviously impossible to fix a contract rate for mill hands or for the laborers in hydraulic mines, hence they must be paid by time.

At the height of the tin boom in 1906, when tin was selling at \$860 United States currency per long ton, the general eight-hour wage for Chinese laborers reached \$0.51, but during the heavy slump in price which followed in 1907-8 the mine owners, by unanimous action, cut this rate to \$0.34. With the steady increase in the price of tin since 1908 wages for both Chinese and Tamils have gradually increased until, as has been shown, the present eight-hour wage in European-owned mines ranges from \$0.34 to \$0.40 for Chinese and from \$0.225 to \$0.26 for Tamils. This increase has been partly due to the growing demand for labor on the rubber estates, but this demand has not affected the supply of mine labor so much as would be expected, since the rubber planters find Tamil labor more suited to their requirements than Chinese and usually arrange to obtain Tamils direct from India instead of attempting to draw

(Continued on page 150)

THE COVENTRY ORDNANCE WORKS, LIMITED

An undertaking of great magnitude is that which was started by the Coventry Ordnance Works some years ago, and the rapid growth of this Company's establishments during the last six or seven years is a sufficient proof that the undertaking has proved a success.



COVENTRY ORDNANCE WORKS.—Barbette with two 13.5-inch Guns

Before going on to discuss the various establishments of the Firm and its output, we may say that the Company itself is owned by a combination of three large Shipbuilding and Engineering Firms,—Messrs. John Brown & Co., Messrs. Cammell Laird & Company, Ltd., and Messrs. The Fairfield Shipbuilding Company, Ltd.

The Coventry Company works largely in conjunction with these three Firms, who are thus enabled to offer tenders for every kind of war material for naval or military purposes, ranging from the large super Dreadnought battleship built, engineered and armed complete to the smallest type of rifle calibre machine gun.

The designs and productions of the Coventry Company have been uniformly successful in competition with those of other manufacturers and in Service trials, with the result that they have been extensively adopted by the British and other Governments for use in Naval and Military Service. The resources, energy and capability of the Firm are such that during the extraordinarily short time of seven or eight years which has elapsed since the formation of the Company it has been possible for them to erect all the necessary buildings and plant, to design and manufacture the very largest types of guns and mountings for Naval Service, with the result that the Company are to-day considered equal to any other Firm as regards work of this description.

Guns and mountings have been manufactured at the Company's Works from the very largest Naval gun to the very smallest machine guns, and the Works are also equipped for the manufacture of all classes of ammunition, complete in every respect, including fuzes, tubes and primers.

The Coventry Company being exclusively Ordnance manufacturers are able to wholly concentrate their attention upon this branch of engineering, with the result that a very high degree of skill is displayed in meeting the

exacting conditions which obtain in the design and construction of modern war material.

The Company possesses four establishments: the main Works at Coventry, the Erecting Works at Scotstoun, near Glasgow, the Ammunition Works at Cliffe on the Thames, and a large Proving Ground near Boston on the Wash. In addition they have Offices in London at 28, Broadway, Westminster.

The main Works at Coventry cover an area of about 60 acres and comprise the Head Offices

of the Company. Here are manufactured Guns, Carriages, Mountings, Aeroplanes, Machine Guns, Cartridges, Fuzes, Sights etc. The forgings for the guns are received from the parent Companies Steel Works at Sheffield; they are treated and machined at Coventry, and are then built up to the finished guns.

The component parts of Garrison and Barbette Mountings are made at Coventry, and are sent to the Scotstoun Works to be erected and tried in the pits.

Field Equipments, medium calibre Nava guns and mountings, small guns and mountings, carriages, aeroplanes, fuzes, etc., etc., are made and completed at Coventry, and delivered direct from there.

The Scotstoun Works receive the component parts of the larger mountings from Coventry, manufacture the plate and angle portions which are too large for railway transport and complete and erect these mountings for trial.

These Works cover an area of about 16 acres and include a large dock for the transport of Service gun machinery. All tests of gun machinery are car-

ried out in numerous pits provided for the purpose prior to its discharge by barge to its destination.

The Ammunition Works at Cliffe on the Thames cover an area of 10 acres and are employed in the manufacture of propelling and exploding charges for guns and projectiles.

A small gun range is situated at Coventry, used for testing the smaller guns and carriages and for experimental purposes, and a large gun range near Boston on the Wash is under

construction. This range will be 12½ miles in length; the whole being level and above low water. It will be used for carrying out proof, ballistic, fuze trials, etc., of a severer nature than can be dealt with at the Coventry range. Projectiles can be recovered for examination.

From the foregoing particulars it will be seen that the Company are fully equipped for the manufacture of the higher classes of Naval and Military Armaments. The Company have been in existence as manufacturers of Armaments since 1905. The rapid growth of the business during this period has necessitated continuous additions to their premises and plant.

As regards the work done in the past by the Coventry Company, it will be sufficient to say that they have manufactured for the British and other Governments war materials of every description, that these manufactures have been tried and proved highly successful, and that a large number of the designs of the most recent guns, mountings, field carriages and equipments, to be found in the British Service, have been drawn up at Coventry in the past.

The earlier work of the Company consisted in the re-armament of British Field Artillery, large quantities of 13 and 18 pounder equipments and of 4.5" Howitzer equipments of Coventry design having been supplied. This work was followed by very large orders for 3", 4" and 6" Naval guns and mountings; many of the most recent designs of this class of ordnance to be found in the British Navy having been drawn up at Coventry.

Within the last 4 years the earlier successes of the Company have been followed by the adoption of a Coventry design for twin hydraulic barbette mountings for 13.5" guns. Mountings of this design have been and still are being manufactured at Coventry and completed at Scotstoun. Contracts for 13.5" and larger guns have been and are being executed by the Company.



COVENTRY ORDNANCE WORKS.—Laird-Coventry Machine Gun

As regards the most recent innovations and extensions of the Company, we cannot do better than quote the references to these made in Earl Brassey's *Naval Annuals* for years 1911, 1912, and 1913. The 1911 edition contains the following paragraphs:

"The Coventry Ordnance Works during the last twelve months have been busily employed in the manufacture of ordnance, ranging from the largest calibre of modern guns down to twelve-pounders, and in

naval mountings from the largest size of barbettes to small transferable mountings. During the present year five barrette mountings will be delivered and other sets are in course of manufacture. A large number of 6-in., 4-in. of various types, and 12-pr. guns and mountings of new design are under construction.

A Coventry type of 6-in. mounting (Mark VI) on the same lines as that illustrated in last year's *Naval Annual* has been adopted by the Admiralty, and a large number are being made at Coventry. This mounting has several unique features, and is an advance on earlier types. Before being adopted, the mounting was subjected to exhaustive trials at sea. These mountings are provided with cast-steel shields made by Messrs. Cammell Laird & Co.

A new design of mounting for destroyers has been designed by the Coventry firm, and has been adopted by the Admiralty. This mounting (the 4-in. Mark V) takes a low-velocity 4-in. gun, and has several novel features. It is an improvement on that mentioned in the *Naval Annual* for last year."

And in 1912 the *Annual* publishes the following:

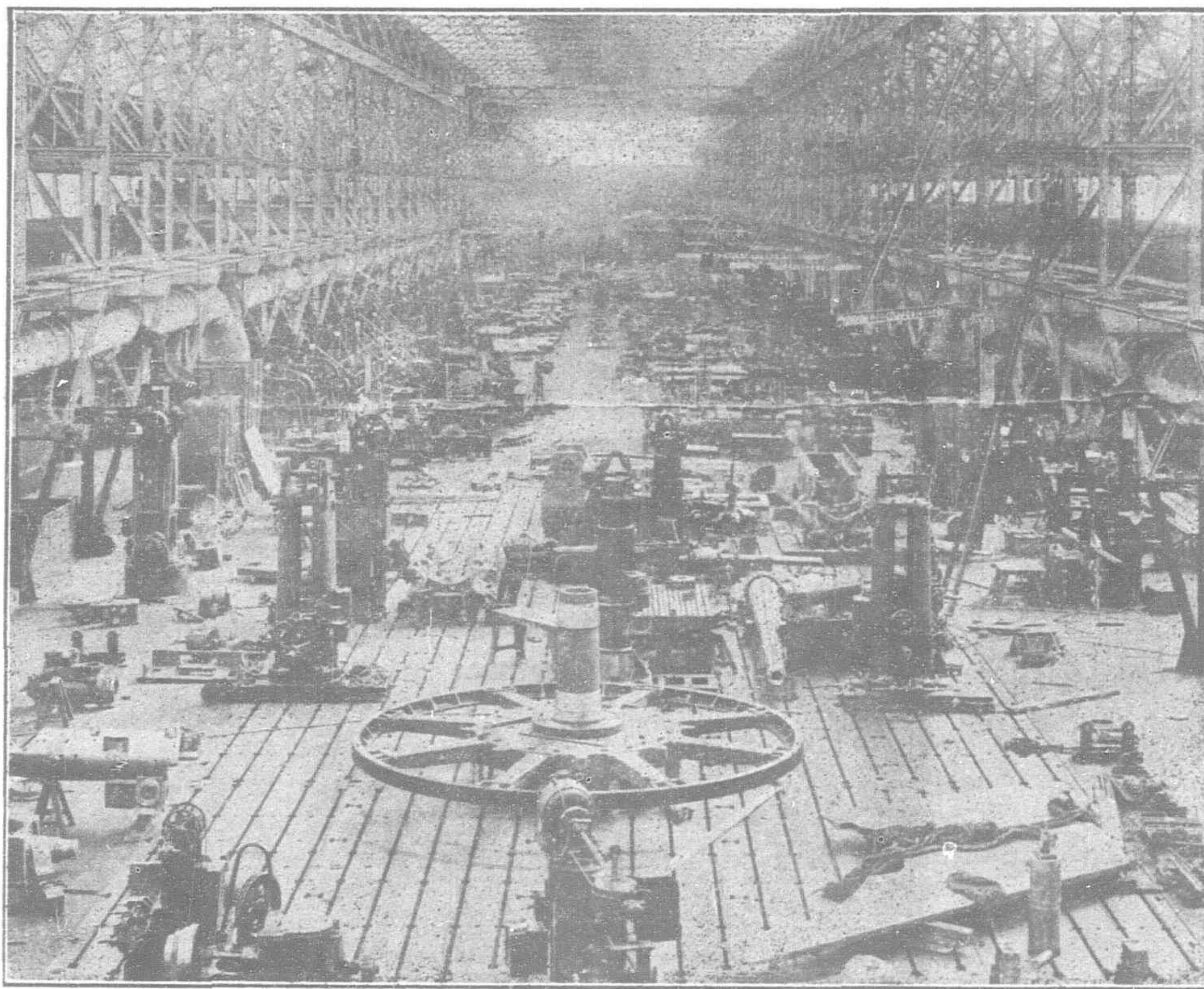
"The expansion of the Coventry Ordnance Works during the last year has been considerable. In order to deal with the increased volume of work and ensure rapid delivery, large additions have been made to the plant of the Company, new shops fitted completely with machines of the latest types being installed at both the Coventry and Scotstoun Works.

Amongst the many other innovations introduced during the last year the following are of general interest:—Designs of guns for the attack of aeroplanes and balloons are being produced and promise to be very successful. Various models of an entirely new design of automatic rifle are being manufactured at the Works. These models can be arranged to be functioned by gas, or recoil, and are being adapted for different sizes and classes of ammunition. An experimental automatic rifle calibre machine-gun has been manufactured and passed through successful trials. The mechanism is similar to that of the automatic rifle, and the designs allow great advantage in weight over existing types, and also have the advantage that when supplied in conjunction with the rifle no special training of the troops is required for the use or care and maintenance of the machine-gun.

Extended and most satisfactory experiments with fuzes for high explosive shell have been carried out, and the fuze design shows several novel features, especially as regards safety arrangements.

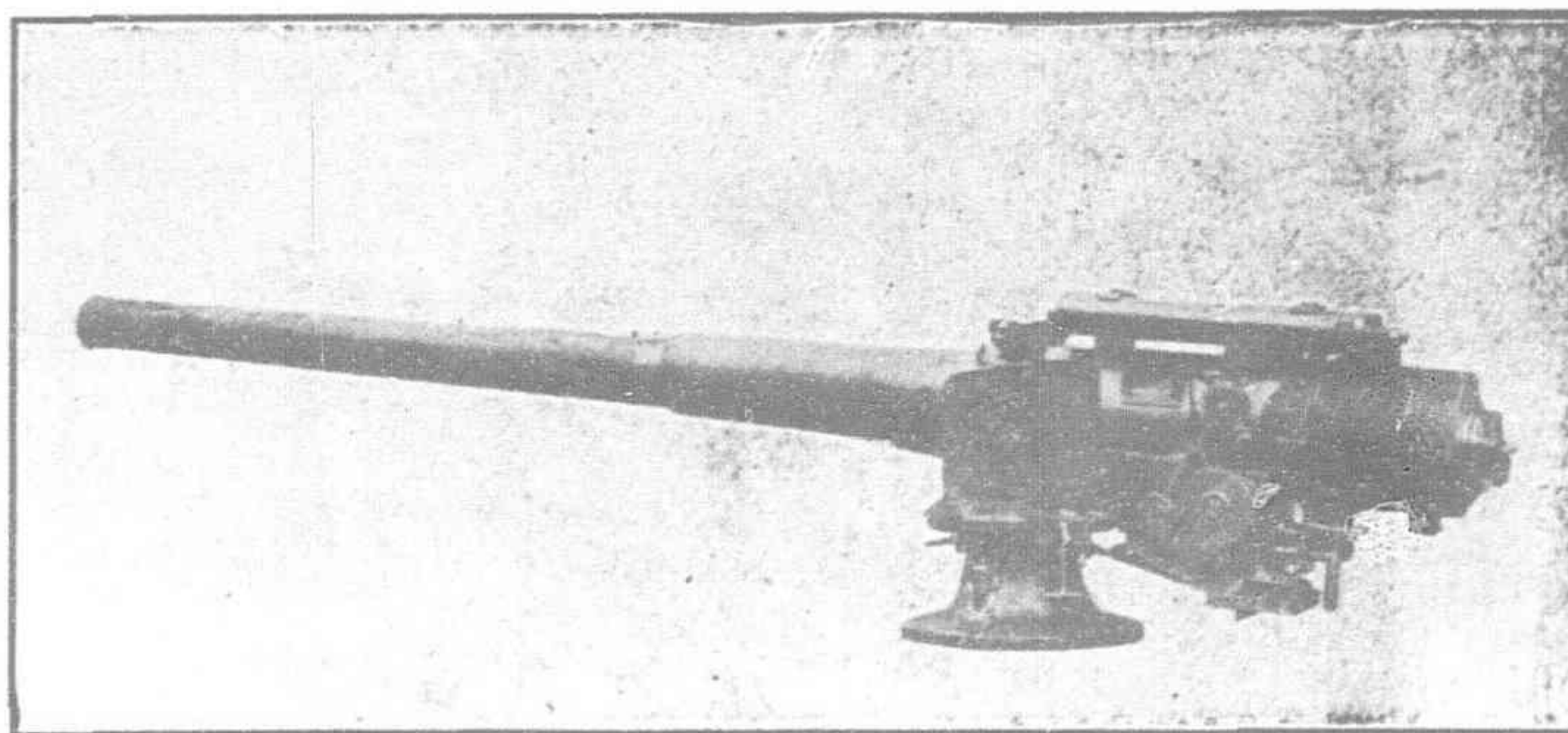
Amongst the improvements introduced

into hydraulically worked mountings is a hydraulic sight. The arrangement is such that the power required to raise or lower the sight is supplied by a hydraulic cylinder, the movement of which is controlled by a rotating valve operated by the range dial



COVENTRY ORDNANCE WORKS.—Centre Bay of the Naval Shop

spindle. The range is revolved by hand in the usual manner. A feature of this arrangement is that the dial can be placed behind the sight where there is ample space in the turret. Also all mechanical gearing, and consequent backlash, is obviated. The optical part of the sight can be passed either vertically or horizontally through the gun-house armour. Owing to the small power required to turn the range dial, this sight readily lends itself to any method of director-control from a central position.



COVENTRY ORDNANCE WORKS.—Six inch Gun and Mounting

Another novel feature in connection with hydraulic mountings is an improved ramming and cordite tilting, by means of which the total time previously required to load any given type of gun is materially reduced.

The 6-in., 4-in. high and low velocity and 12-pdr. designs of mountings have been improved and brought up to date in the light of recent experience.

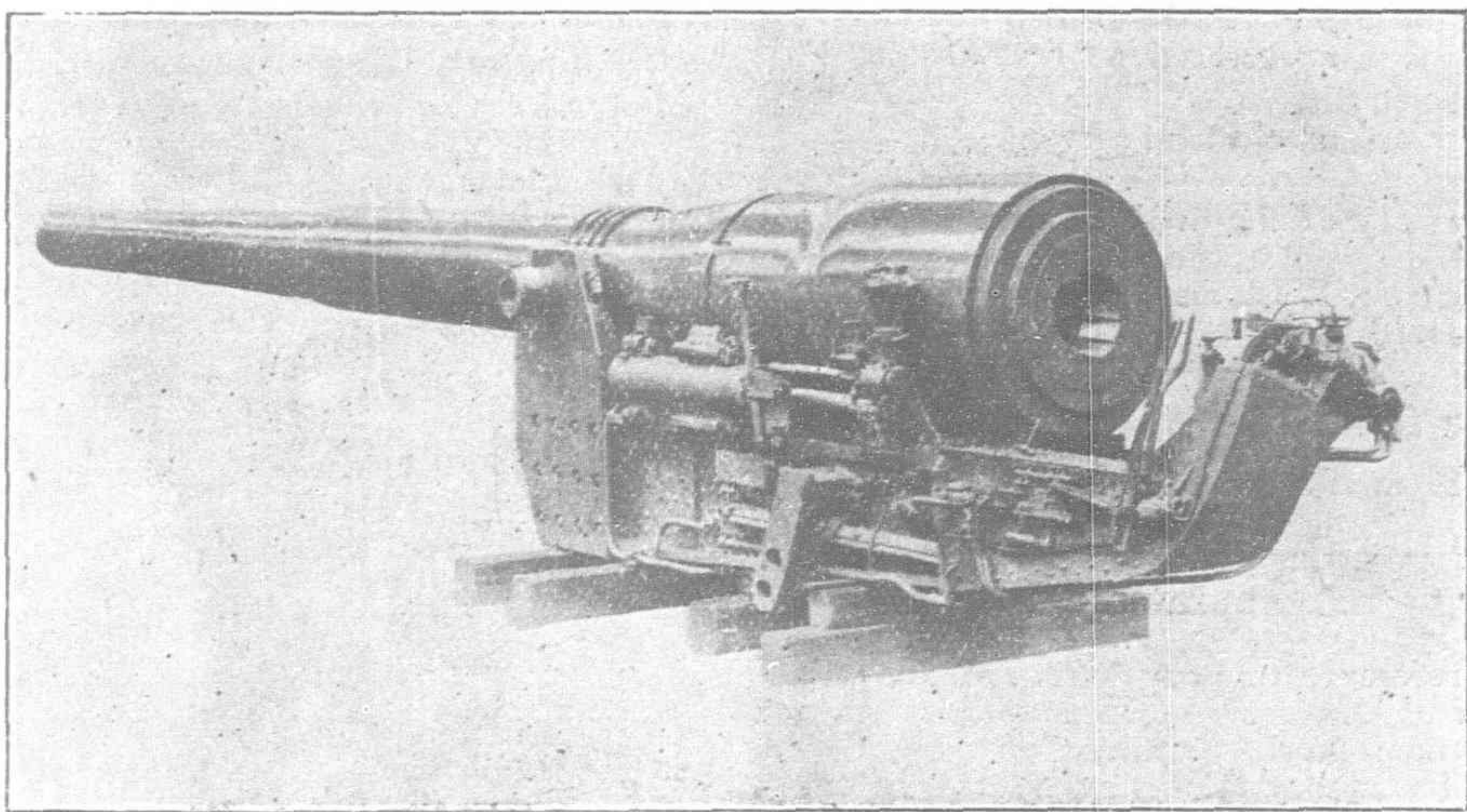
As regards the number of contracts

now in the hands of the Coventry Company rapid strides have been made during the last few years. Guns of various sizes, including the very largest manufactured, have passed successfully through proof, and several contracts for guns up to the largest sizes are now being executed for the British and other Governments. The five twin 13.5" hydraulic mountings for the *Conqueror* have all been tried with marked success in the pits at the Scotstoun Works of the Firm, and the gunnery trials of these mountings at sea will probably have been carried out before this volume is in print. The manufacture of the five similar mountings for the *Ajax* (the order for which was placed during the latter part of 1910) is nearing completion. A further order for a set of five heavy mountings for a battleship of the 1911-12 programme has recently been received. A new Coventry design Mark VII. of a 6-in. upper deck shielded mounting has recently been accepted by the Admiralty, and an order for a number of these mountings is in hand. Several contracts for various sizes of the Coventry-Holmstrom breech mechanism have also been made.

The 1913 *Annual* contains several references to Coventry Ordnance Works, amongst them being the following:—

"The gun-mountings for the *Conqueror*, which were designed and manufactured by the Coventry Ordnance Works, Limited, have now satisfactorily completed their trials. These mountings embody several novel features, particularly as regards the recoil arrangements. These latter, being of a new and improved design, required certain adjustments, which caused some delay in the handing over of the ship. The gun-mountings for the *Ajax* and *Benbow* belong to a design of the Coventry Ordnance Works, Limited, are now being completed by that firm. Orders have been received by this Company during the year for Holmstrom breech mechanisms, which are now being manufactured in all calibres up to 14 in. The reports received from the ships in which this mechanism is fitted are of the most gratifying nature, and it seems probable that its adoption on a large scale by various Governments in the near future is assured.

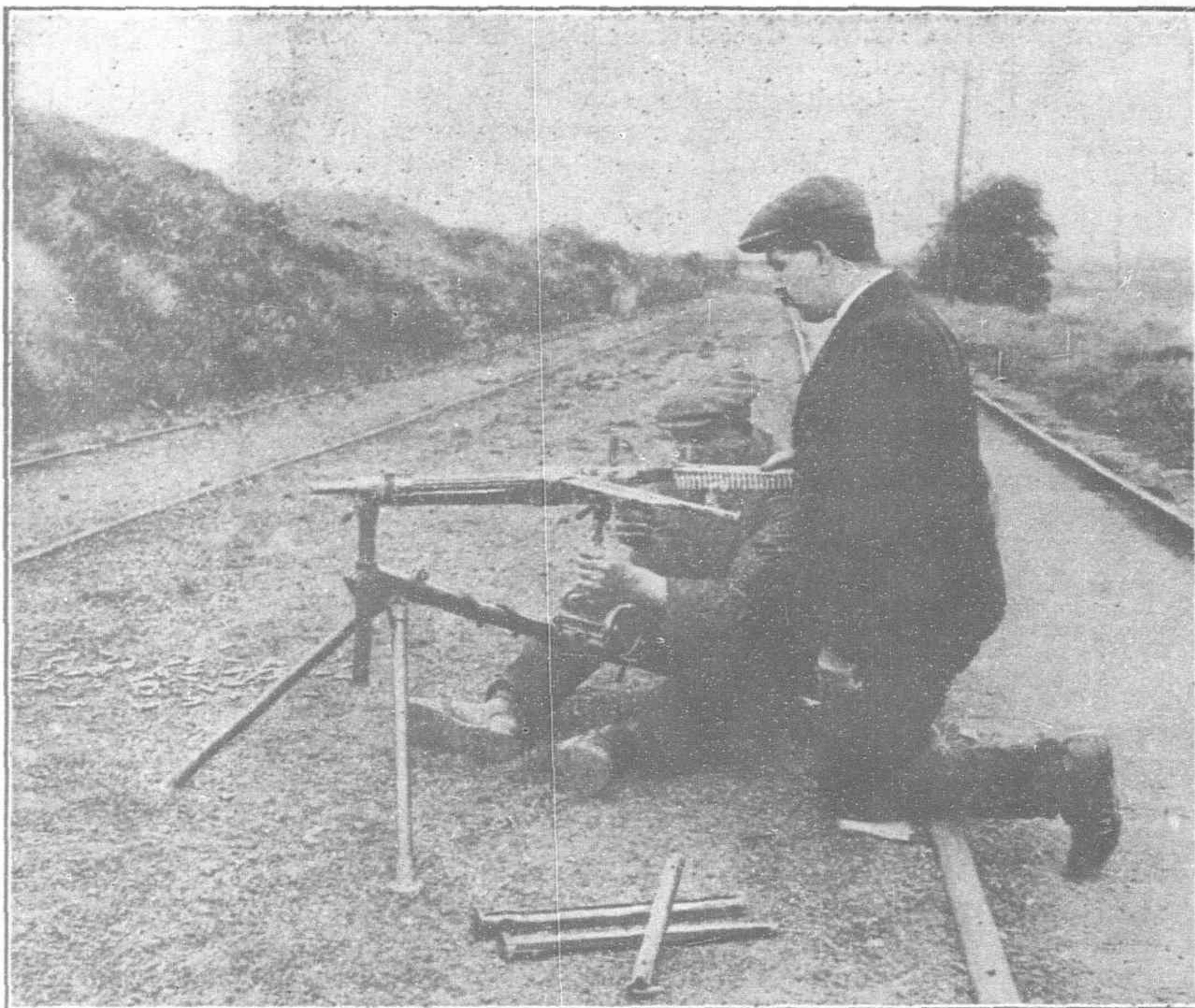
"The Coventry Company have also during the past year developed designs of guns and mountings specially for use against air-craft and also a gun for mounting in air-craft. The special features of the anti-aeroplane gun are a sight which is intended to allow for the speed of the aeroplane, and a predicting device which will make the setting of the shrapnel fuse, hitherto considered an almost insuperable



COVENTRY ORDNANCE WORKS.—13.5 inch Gun on Slide

difficulty for this class of work, a matter of the greatest precision. The exact setting of the sight for range, elevation and speed of target is controlled automatically by the range-finder.

The same firm have been working for the past year on a machine-gun of rifle calibre, and hope in a short time to be in a position to put forward a weapon capable of meeting all the requirements which this type of ordnance has now to fulfil. The demand for a machine-gun for mounting on aeroplanes has shown that the usual beltfeed gun has considerable disadvantages when so used, and that a gun provided with a simpler system of feed, such as magazines or chargers, and capable of being easily handled by one man, is more suitable. The Coventry gun is suited for this class of work, and the weight of the gun is a recommendation in its favour."



COVENTRY ORDNANCE WORKS.—Laird-Coventry Machine Gun

Since the publication of the *Annals* above referred to, the armament of H.M.S. Ajax has undergone its trials in a most satisfactory manner and passed into the service, considerable orders for Coventry machine-guns have been received, also other important orders, including order for the armament of one of 1913-14 British Dreadnoughts, orders from the British Government for Aeroplanes, etc., etc.

Orders for war materials have also been received at different times from the Chilian, Japanese, Russian, Swedish, American, Canadian Governments, etc.

A Small-Tool Department at Coventry supplies twist drills, milling cutters, specially hardened screw gauges, etc., for the Works and for commercial purposes.

The Coventry Ordnance Works are represented in the Far East by Messrs. Samuel & Co., Ltd.

THE PEKING SYNDICATE

In conformity with the wish expressed by shareholders at the general meeting last December, a circular has been issued by the Peking Syndicate giving information regarding the company's operations before the annual meeting.

It states that in October last Mr. Benque, a mining engineer, was engaged to report upon the company's works in Honan, and that his

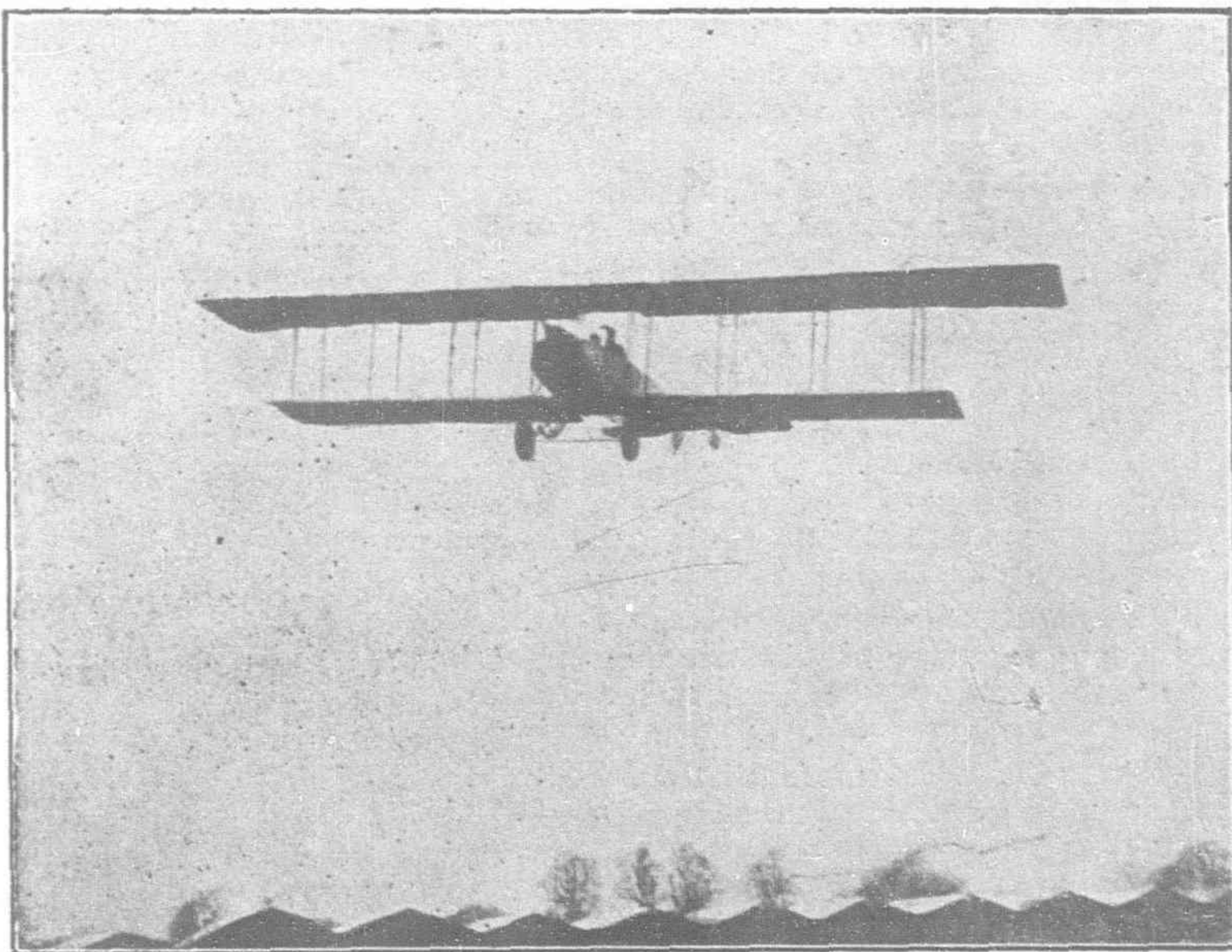
report, dated January, 1913, confirms the favourable statements previously given to the shareholders regarding the quality of the coal and the prospects of the colliery. The recent decrease in the output, recorded in the monthly statements, was caused by the flooding of two of the most productive pits, Nos. 2 and 4. Steps have been taken to increase the output of No. 6 Pit to 600 tons per day, whilst a scheme was approved in April last by the directors whereby coal can be worked in the native way, cheaply and without new plant, by small pits which it is hoped will yield up

to 1,000 tons per day in due course. Several of these pits are already being sunk. Further, in May last the directors approved of another proposal for putting down a pair of modern shafts near No. 24 Borehole, where good coal is proved to exist at a depth of 300ft. This plant will be electrically worked from the present power plant, and is estimated to produce 1,000 tons per day. The first shaft on July 2 was already 120ft. deep, and coal was expected to be reached about the middle of August.

As far as practicable, without sacrificing the interests of the shareholders, it has been the directors' policy not to involve the company in any increase of either capital or working expenditure, but in order to meet the consequences of the accidents mentioned the directors have approved of this new development work.

Steps are now being taken to extend the company's activities under the rights conferred by the Honan Concession of June, 1898. In this connection the Syndicate has assisted in the promotion of the Banque Industrielle de Chine. The directors announce that the Agent General, Mr. J. R. Brazier, is compelled to sever his connection with the company and return to Europe for family reasons. The appointment has been given to Mr. J. P. Kenrick, who has occupied the position of Engineer-in-Chief at the collieries for six years.

THE stimulation of plant growth by means of electrical currents has now, says the *Scientific American*, been carried on over a period of 167 years, and to this day it is hard to point to any tangible and generally applicable results of these investigations, nor has this mode of cultivation yet entered into the calculations of the ordinary agriculturist for horticulturist. In a voluminous work on electroculture recently published by Dr. A. Bruttini, of Rome, it is stated that 187 persons are known to have carried on experiments in this field. Of these, 133 reported favourable results, 21 were doubtful, while 33 found the application of electricity to plants to be distinctly unfavourable. A majority of the first group employed more or less unscientific methods. Nevertheless electroculture continues to be the cherished dream of many present-day experimenters, as is witnessed by the fact that an "International Congress of Electroculature" was held at Rheims last autumn.



COVENTRY ORDNANCE WORKS.—Biplane in Flight

CORRESPONDENCE

(The views expressed by correspondents are not necessarily endorsed by the FAR EASTERN REVIEW).

THE PEKING LEGATION MACHINERY

To the Editor of the

"FAR EASTERN REVIEW"

SIR,

In order to remove a serious misapprehension which is damaging British engineering interests in China, the British Engineers' Association has obtained the authorization of H. M. Office of Works to publish a letter addressed by that Department to this Association, dated March 7th, 1913, and a schedule containing the names of certain contractors which accompanied it. Copies of these are attached to this letter.

These documents have to do with a contract for an electrical and refrigerating installation recently erected at the British Legation in Peking.

The conditions surrounding the invitations to tender and the placing of this contract have led to very general belief that the machinery was manufactured in Germany.

The false impression to the effect that the official centre of British interests in China had been equipped with German machinery has proved a severe blow to British engineering prestige. The Chinese are continually told, by the representatives of certain continental firms, that the British Government were obliged to go to Germany because there were no makers in England capable of doing the work satisfactorily.

The enclosed documents show that there is no foundation whatever for this statement.

This Association would therefore deem it a favour if you would give publicity to the letter from the Office of Works above referred to, and to the following facts:—

- (1) The contract was not given to the Siemens China Electrical Engineering Company, a purely German concern representing the Siemens German interests, but was placed with the Siemens Bros. Dynamo Works, Limited, in London. Whether this firm is considered British or not, it possesses works in Great Britain.
- (2) Messrs. Siemens only manufactured a portion of the plant in question, and this, according to the enclosed letter, was manufactured not in Germany, but in England.
- (3) The rest of the plant was also manufactured in Great Britain by the British firms whose names are given in the schedule attached, some of whom are members of this Association.

The following causes gave colour to the misconception that the machines were German:—

- (a.) Until now no official denial has been published.
- (b.) The erection of the plant at the Peking Legation was entrusted to a German firm in China, the Siemens China Co., and this Co. were assumed by many to be the contractors owing to a similarity between their name and that of the contractors.
- (c.) The public generally have either been unaware that there was a stipulation that the whole of the plant must be made in Great Britain, or have believed that such a stipulation was not enforced.

This Association is aware that the manner in which this contract was negotiated and placed, has caused grave dissatisfaction among the purely British firms who originally tendered. On this question, however, I am not directed to enter. The point which this Association is anxious to make clear is that, on the authority of H. M. Office of Works, the whole

of the plant installed at the British Legation in Peking, was manufactured in Great Britain.

I am, Sir,

Your obedient servant,

STAFFORD RANSOME,

Secretary of the British Engineers' Association.

Caxton House, Westminster,
London S.W.

Letter from His Majesty's Office of Works, dated 7th March, 1913, to the British Engineers' Association.

SIR,

With reference to your letters of the 12th instant and 22nd ultimo, I am directed to furnish the following information respecting the Contract for Engineering Works at the British Legation at Peking.

1.—Tenders were originally invited in August, 1911, from British firms only, and before an invitation was issued to the firms whose tender was ultimately accepted they were required to satisfy both the Board's officer in Peking and the British Consul that they might be so regarded.

2.—Owing to the condition prevailing in China in December, 1911, the Board decided not to proceed with the work, and the firms who tendered were informed accordingly. No undertaking was given, however, that fresh tenders would be called for at a subsequent date.

3.—When it was found possible to proceed with the work time did not permit of the invitation of fresh tenders, but the two firms who had submitted the lowest tenders in the first instance were asked to submit fresh prices. The more favourable tender, that of Messrs. Siemens Brothers Dynamo Works, Limited, was then accepted.

4.—The whole of the plant has been manufactured in England. A Schedule is attached showing the names of the sub-contractors by whom the various parts of the work have been undertaken.

5.—The erection of the plant is being carried out by the contractor's representatives, the Siemens China Electrical Engineering Company, under the supervision of a British engineer, by whom Chinese labour is being employed direct.

I am, Sir,

Your obedient servant,

(Signed) LIONEL EARLE.

The Secretary,
British Engineers' Association,
Caxton House,
Westminster, S.W.

British Legation, Peking

Main Contractors for the above contract—
Siemens Brothers Dynamo Works, Limited.

The following is a list of the contractors and the material they are supplying:—

SPECIFICATION A.

This covers:—

1.—Steam Heating installation.

2.—Hot and Cold water supply installation.

1. Steam Heating.

Contractor.

Messrs. Babcock and
Wilcox.

Material.

Main Boilers and fittings, Weir's feed pump, pipe-work in boiler, house and engine rooms.

" Atmospheric
Steam Heating Company.

Complete steam heating installation in the various buildings, including pipework, feed-water heater, vacuum pumps, radiators, valves, fittings and accessories.

2. Hot and Cold water installation.

Contractor.

Messrs. Rees Roturbo
Mfg. Co.

" Siemens Brothers
Dynamo Works,
Ltd.

" Whipp and
Bourne.

" Fredk. Braby
and Co.

" Hartley Sugden,
Ltd.

" Stewarts and
Lloyds.

" T. and W.
Farmiloe,
Limited.

" Merryweather and Sons
Limited.

" Thos. Piggott
and Co.,
Limited.

Material.

1,000 gallon pumps.

Motors for above
pumps.

Starting gear for
above Motors.

Tanks, Cisterns
and Cylinders.

Dome top boilers.

Valves and lap
welded tubes and
accessories.

Lead piping, paint,
etc.

Fire Hydrants.

12 x 12 x 8 ft.
pressed steel tank.

SPECIFICATION B.

This covers:—

1.—The Electrical Generating Plant.

2.—Ice-making Plant.

1. Electrical Generating Plant.

Contractor.

Messrs. Siemens
Bros. Dynamo Works,
Limited.

Material.

Main generators,
main switchboard,
main cables, motor
booster set, wiring
material for engine
and boiler rooms,
electrical fittings
and accessories.

Main Engines.

" Belliss and
Morcom, Ltd.

" Pritchett and
Gold.

Battery.

2. Ice-making Plant.

Contractor.

Messrs. Siemens
Bros. Dynamo Works,
Limited.

Material.

Motor for driving
ice-making plant.

Mr. Sam. Puplett.

Ice-making Plant.

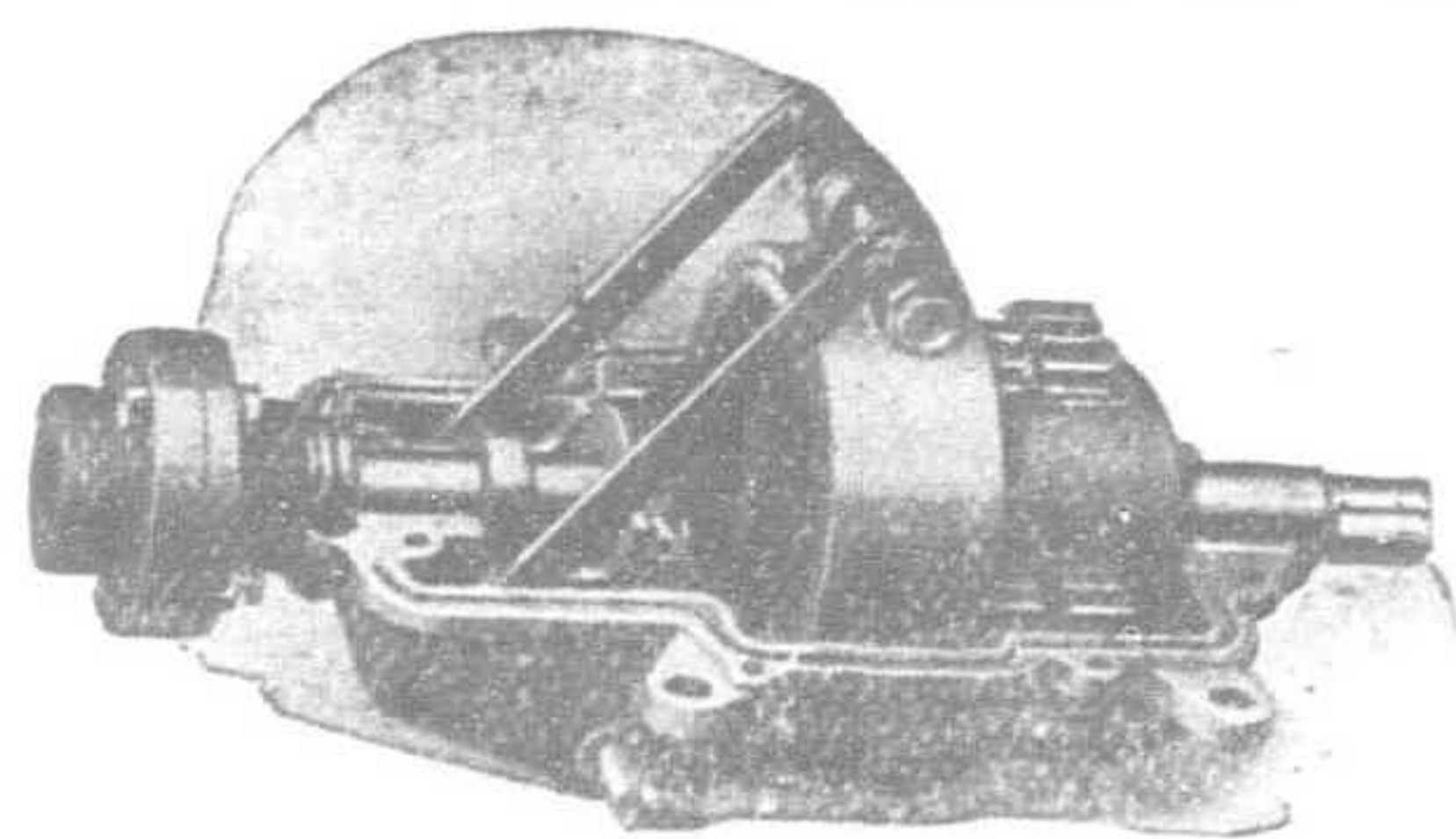
VLADIVOSTOK TRAMS

Commenting on the tram service of Vladivostok a correspondent of a Tokyo paper writes "Vladivostok now has several fairly well-paved streets and a tramway—the first of the kind in Siberia. Japan might take a valuable hint or two from the manner in which Vladivostok manages its system. Of course the cars are small, since the traffic cannot be mentioned in the same breath with that of a city like Tokyo or Osaka; but in all that relates to cleanliness and comfort the Vladivostok trams are far superior to the Japanese. To begin with, every car is divided into first and second class, the minimum fare for each being eight and five kopeks respectively. The fare, however, varies according to distance, the highest first class fare being twenty kopeks, which will take the traveller over the entire system. There are two conductors on every car, one for the first and the other for the second-class division. Tokyo might also imitate the sanitary wooden seats adopted in these cars in preference to retaining those red-plush abominations which amass untold quantities of dust and bacteria. Here, too, tickets are not collected when the passengers alight nor are they clipped. The method of what in Russia is almost reverentially styled "control" appears to be very elaborate, for there are almost as many inspectors as there are cars. The single trolley line is in use, and the exasperating delays which are continually occurring in Tokyo to permit the conductor to restore the detached trolley poles to the double wires overhead are unknown here."

MOTOR BOATS AND THEIR EQUIPMENT

THE BALDRIDGE REVERSE GEAR

We understand that for the 1913 season the Baldridge Gear Co. have placed on the market five new models, suitable for engines 4½ h.p. to 12 h.p., 7 h.p. to 20 h.p., 10 h.p. to 30 h.p., 15 h.p. to 45 h.p. and 25 h.p. to 60 h.p. In these new models numerous improvements will be found. In general design the Baldridge is of the balanced planetary type, a special feature being that the cage, which contains the train of gears acts as the driving instead of the driven member. The cage is fitted with a two-step gear on each side, and couples to the crankshaft of the motor by a flange. The double gear construction insures good balance, eliminating side strain or vibration. Another characteristic is that instead of driving



through a broken shaft, the propeller shaft extends in unbroken section from the supporting propeller and bearing to the forward.

The essential of a reversing gear being a powerful clutch, the improved type of internal or ahead clutch used in this design will be found to be capable of carrying large overloads beyond its rated capacity. It is fitted with double expansion members providing uniform expansion and contact against all parts of the drum. The reversing clutch band, made of alloy steel, has double cam levers, accomplishing equal expansion and contraction of this clutch, so that, when the ahead clutch is in engagement the reverse clutch is free and separated not only from the drum, but also from the housing and frame, obviating change for binding, friction or contortion.

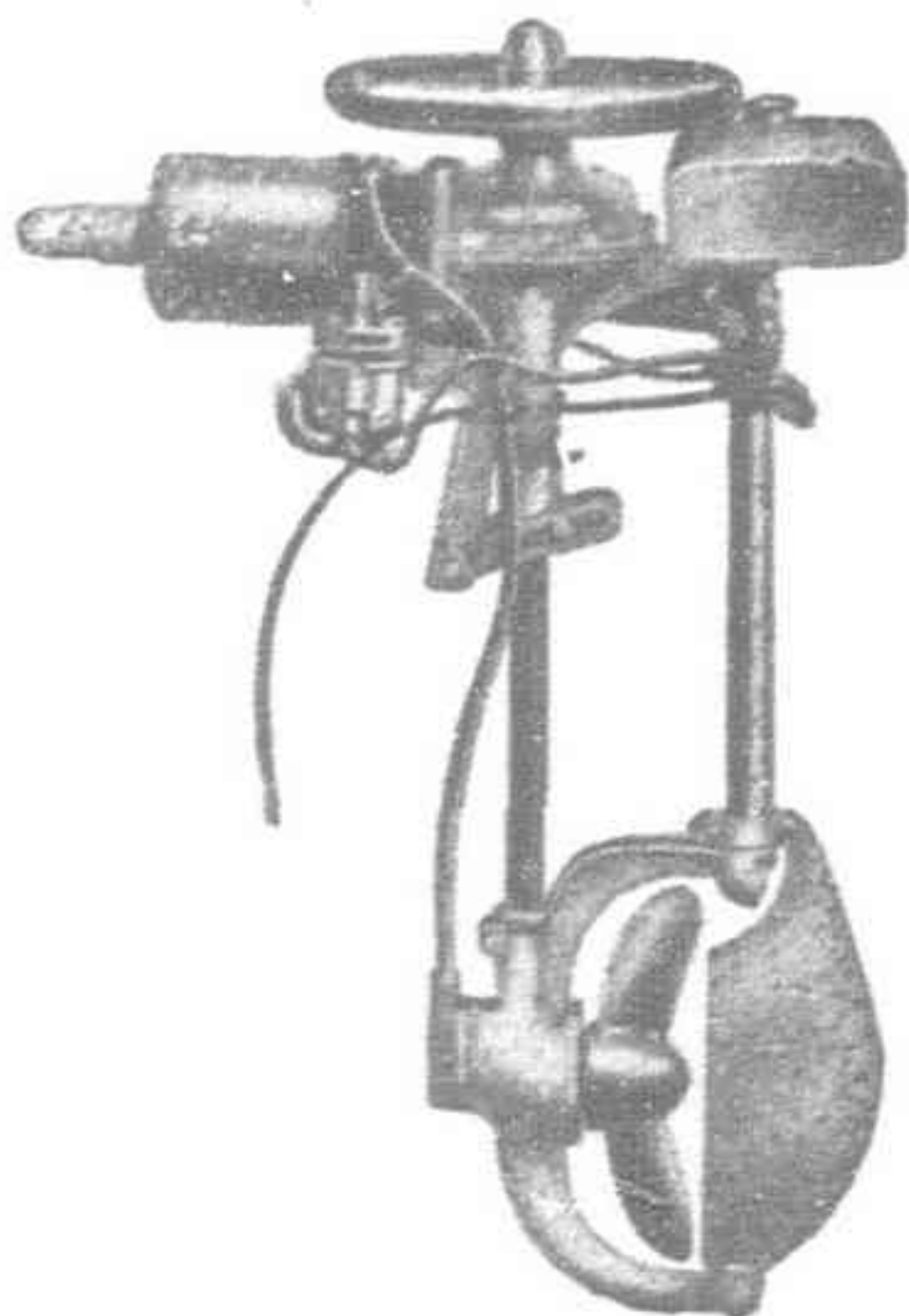
The gearing is entirely enclosed in iron or aluminum casing, and there are no moving parts outside except the control lever, preventing possibility of leakage, throwing of oil and grease, or injury to the operator. The operation is by a single control lever. A new feature is the construction of the control lever in two parts, the upper portion being tubular, fitted into a socket in the lower portion. In emergencies, by a single movement of the lever it is possible to shift from full speed ahead to complete reverse without damage. Lubrication by the splash system is positive, and requires attention only at long intervals. The lower section of the casing is kept about half full of lubricant, which is automatically distributed to all parts by the revolving internal mechanism. The makers are The Baldridge Gear Company of New York. Catalogs and further particulars may be obtained on request.

THE WATERMAN OUTBOARD MOTOR

Some owners of small sailing craft and dinghies raise objections to auxiliary motor power on the grounds that valuable accommodation is occupied by the machinery. This drawback is easily overcome by installing, or rather fitting a device such as the Waterman Outboard Motor on the stern of the boat. There are quite a number of such devices, and one of the first made was the one in question. We have been advised by the Waterman Co. that although they have been manufacturing this set since 1906, and have introduced many new models since then, they have never before made so many changes and improvements in the design as when bringing out this season's equipment. A few details of the construction may be of interest.

The motor is of the conventional two stroke type with the crankcase volume reduced to a minimum, giving a high base compression and consequently a good range of speed

control under throttle. This, taken with careful design of port area in relation to piston displacement, gives the greatest possible power for the bore and stroke, and also a high efficiency and economy of fuel, which is aided by the length of the stroke—3"—in proportion to the bore—2¾"—for it has been found that economy and efficiency cannot easily be secured in relation to power with a relatively short stroke engine. The power developed by this engine is 3 B.H.P.



In the new model is fitted a water jacket of spun copper attached to the cylinder by a method which they originated some years ago in their high-speed lightweight engines of the ordinary marine type of from 8 H.P. to 24 H.P. The fly wheel is counter weighted and its rim is finished as a hand wheel with which the engine may be started in either direction.

To prevent damage from knocks and also to save the operator from contact with its electrode, the sparking plug is provided with a protecting cap. This protector, as well as the crank case, clamps, thrust links, exhaust pipe, rudder yoke, rudder, and gearcase, are of copper alloy aluminum for salt water use. This alloy has now been tested by the manufacturers for eight years and has, they claim, proved to be unaffected by the action of salt water.

Revel gears are arranged in the gearcase and are run in non-fluid oil, one filling being usually sufficient for a season's uses. A bronze gear pump is fitted into the end of the gearcase, and carries cooling water from the inlet through a copper tube to the water jacket, from the overflow of which it passes into the exhaust pipe.

The rudder is swung on a skeg, which is cast integral with the gearcase, and protects the propeller in case it projects below the boat's keel. Steering is by means of a rudder yoke and metal cored tiller line. The ball bearing with its hardened and ground steel collars and balls are carried in a bronze retainer. This bearing is literally bathed in oil at all times, and takes the entire weight of the fly wheel, crank shaft, shaft coupling, driving shaft and driving gear. Another feature is the location of the supporting clamps. They are swivelled on the engine cylinder at a point near the center of gravity of the engine and take the driving thrust through the adjustable links from the upper portion of the drive tube, thus taking all thrust or driving strain away from the crankcase.

The carburetor is of the usual float-feed type with a "floating ball" automatic air adjustment made especially for this engine by the Byrne-Kingston Co. Ignition is by battery and trembler coil neatly boxed and wired in the standard equipment, but a Boech magneto is furnished when desired. The makers are The Waterman Marine Motor Co., No. 47 Broadway, New York. Catalogs and further particulars may be obtained upon request.

MORSS MOTOR BOAT EQUIPMENTS

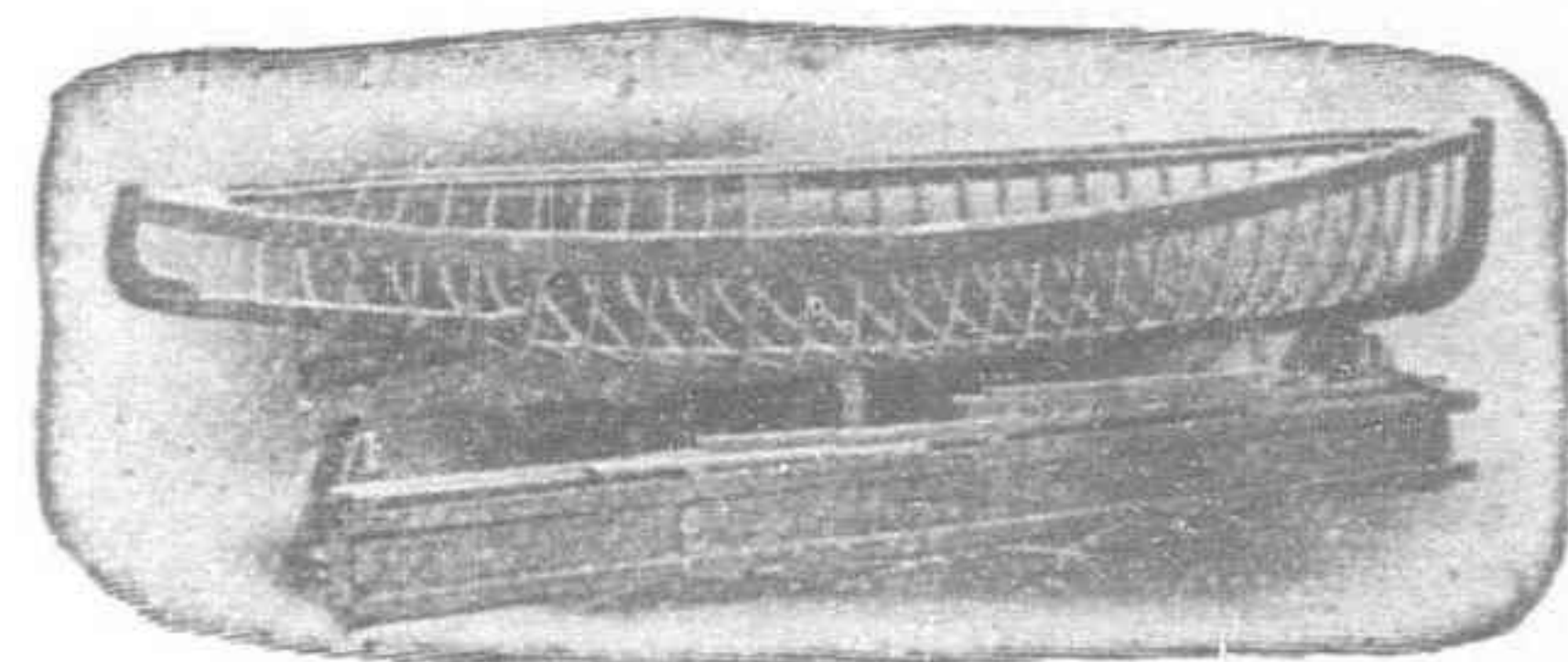
The A. S. Morss Company of Boston is one of the leading marine supply houses in the United States of America. The Company's extensive line includes fittings of every conceivable sort for boats of every kind and size, as well as tools and supplies used in building boats.

A well-constructed and successful boat must be built from a good design, of good materials and by a skilful builder, and must be fitted with suitable appurtenances. This means that the hardware and fittings must be designed for marine use. Ordinary house hardware will not give satisfaction. The matter of fittings is really of more importance than most people imagine, as the durability of the boat, as well as the general style depends so much upon them. The Morss Company has been in business for over 68 years, so naturally it knows the requirements of boat owners and boat-builders.

In addition to the stock line of articles, this Company maintains a mechanical department for manufacturing special steering gears, fits up propellers with shafting, makes special forgings, castings, and tanks of all descriptions. This feature is very valuable to the boat owner, who, in many cases, is unable to find exactly the fitting he requires in stock.

The Morss marine hardware catalog is a 600-page pocket-size book, is fully illustrated and is a veritable compendium of information about boat fittings. This enables a person in any part of the world to select an order of goods with the certainty of getting exactly what he wants, and Morss customers may be found in all quarters of the globe. A request for quotations is welcomed by this Company and its prices will be found to be right.

Address inquiries to the A. S. Morss Co., No. 47 Broadway, New York City, New York, U.S.A.



THE NIAGARA MOTOR BOAT COMPANY

The Niagara Motor Boat Company are the originators of the famous "Niagara" system of building boats from finished but not assembled material.

The "Niagara" knocked-down sets include every item necessary to complete the hull with clean and simple instructions for the assembly.

One very salient feature of Niagara frames is the fact that each frame is first carefully set up and each part fitted, making the reassembling of it a very simple matter.

Boats built from these frames will be found to be of excellent design and thoroughly up-to-date owing to the fact that new designs are gotten out each year. The Niagara Motor Boat Company has published a handsome 48-page book showing the advance designs for the season of 1913. A copy will be mailed to any one interested upon request.

The makers are The Niagara Motor Boat Company, No. 47 Broadway, New York City, New York, U.S.A.

A CONSIDERABLE proportion of the small mild steel castings used in automobile construction are now, according to the *Ironmonger*, being produced in the electric furnace. Many of these parts come from Switzerland, but they are also being made in several places in England. One of the largest automobile firms has recently installed an electric furnace at its works for the purpose of supplying its own castings. Several furnaces of this kind have been at work commercially in Sheffield for some considerable time, and others are in the experimental stage, but in view of the competition which is growing outside that centre a development of electric melting may be expected there in the near future. The demand for automobile castings has attained large proportions, and has increased so rapidly and continuously that, in spite of the additional makers who have come into the field, there is no difficulty in obtaining as many orders as can be executed.

"AMERICAN" TRIPLE GEARED RADIAL DRILL

The accompanying illustration shows an "American" Triple Geared Radial Drill, equipped with power tap leading mechanism, making it possible to lead taps by power. The purpose of this mechanism is to feed the spindle at the same rate of advance per revolution as the pitch or lead of the tap being used. This

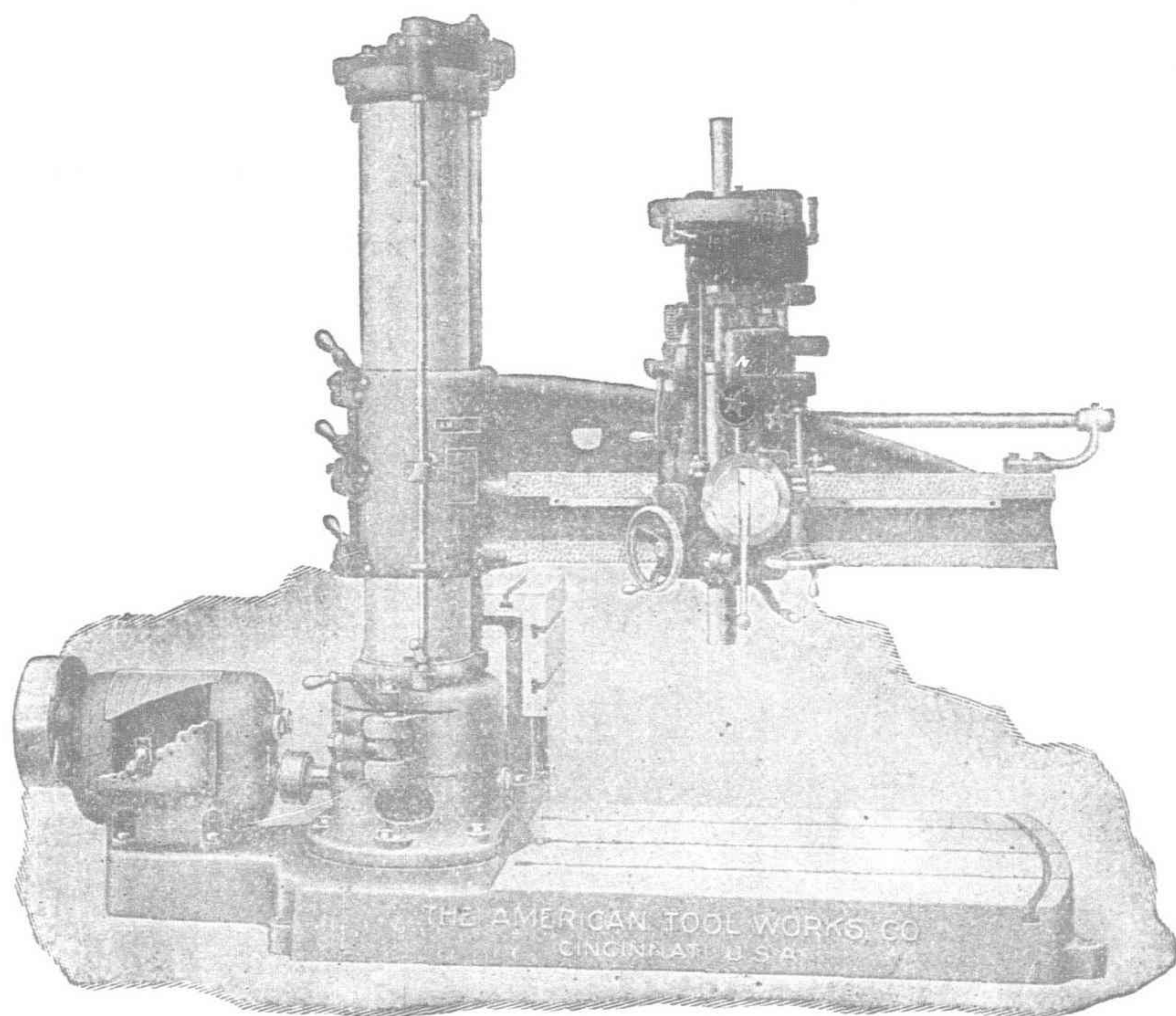
operating rod and drive key for connecting the various feeds and leads.

There is absolutely no interference between the feeds and leads, as the mechanism is arranged to automatically engage one while the other is in use. When not in use the lead mechanism can be disengaged from the spindle gear which drives it, thus preventing unnecessary wear on the gears, etc.

The large dial on which the leads are indicated is divided into two circles;

This range may be varied within certain limits.

The above company has supplied quite a number of their Radial Drills with this mechanism, and inquiries made by them with reference to the operation of the same, prove that the device is highly satisfactory in every respect; in fact, before putting this mechanism



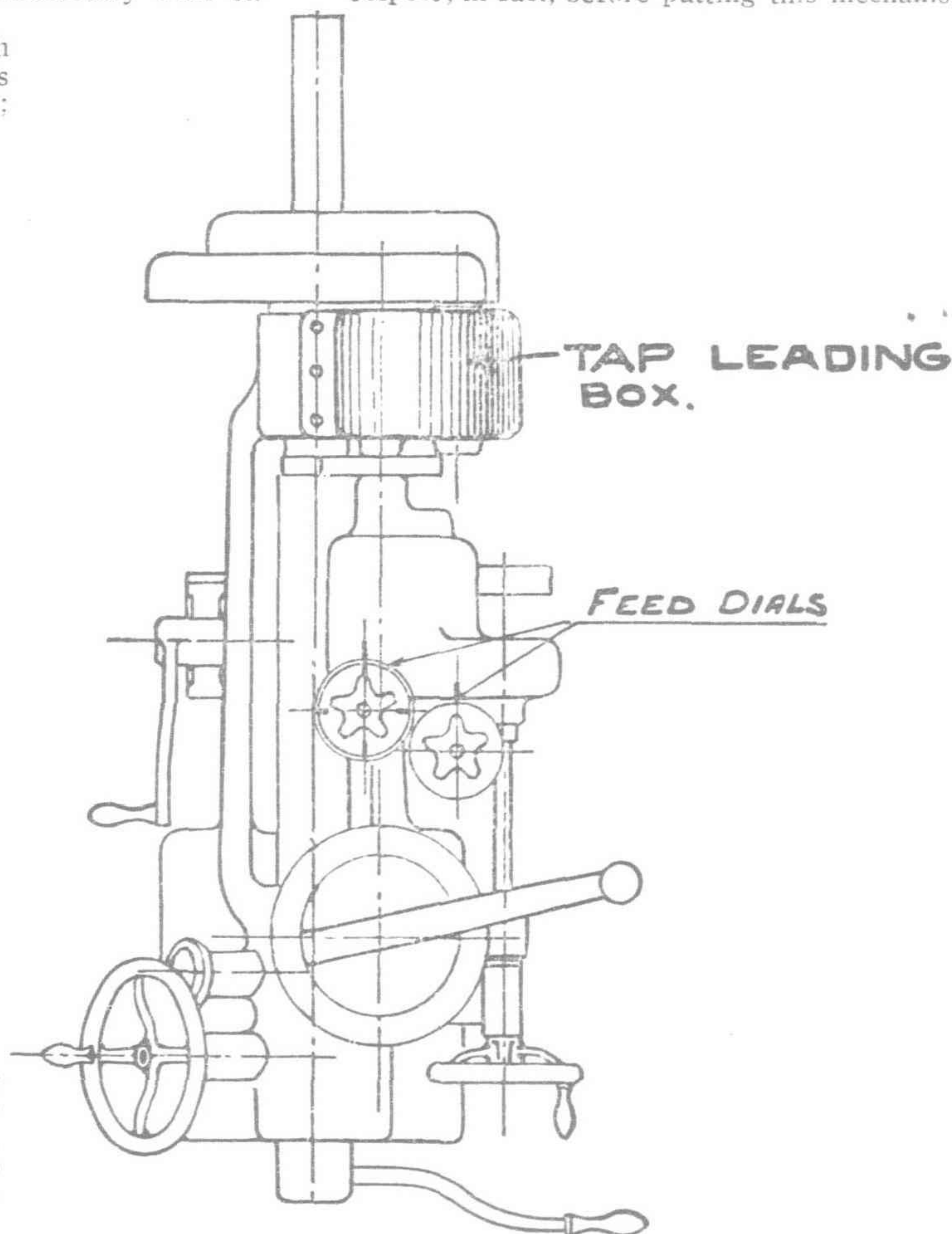
feature is of great value, as it prevents the reaming or crossing of the threads, also the distortion due to the weight of the tap, the effort required to feed itself and to pull the spindle after it, while tapping, also prevents unequal wear on the tap, consequently insures much longer life.

The tap leading mechanism is a separate enclosed unit, mounted upon the head, directly above the regular feed box, and is connected to the box by means of a shaft which carries the

the regular feeds being shown on inner circle, the leads on the outer circle. All that is necessary to do in order to obtain any desired lead is to turn the dial until the lead shown thereon comes opposite the fixed pointer.

Four rates of lead are regularly supplied as follows:

8-10-11½ and 12 per inch.



on the market, it was given a very thorough test under the most severe conditions. The result not only equalled but even exceeded their expectations.

MINING IN THE FEDERATED MALAY STATES

(Continued from page 144)

them from the mines. The Chinese find that they can, as a rule, earn more in the mines than on the estates, and consequently only a few, who are required for such heavy work as felling, clearing, and trenching jungle land, are to be found in the rubber districts. These few are usually working on the contract system under a Chinese contractor and receive about the same pay as mine coolies.

It may be mentioned that wages in Chinese owned and managed mines are often 10 to 15 per cent less than in European mines. To some extent this may be due to a natural preference of the Chinese coolies for working under superintendents and managers of their own race; but it is generally said that many Chinese mine owners hold their coolies by a debt bond, arising from loans and advances, which the coolie find it almost impossible to discharge, and must remain, even when higher wages are offered him elsewhere. The conditions in the Chinese mines are undoubtedly better to-day than formerly, owing to the efforts of the Protector of Chinese, an officer under the Federal Government, but owing to illiteracy and ignorance among the coolies these abuses can not be entirely prevented.

TRIBUTE SYSTEM

The foregoing figures show that 55 per cent of all the labor in the tin mines in 1910 was working under "tribute," and it is estimated that 65 to 70 per cent of all ore recovered is won by this method of labor. Tribute is the local term for "working on shares." The holder of a mining lease often avoids the risk incident to working his property by allowing individuals, or a Chinese employer of labor, to work the mine upon payment of a fixed per-

centage of the ore recovered. The percentage depends, of course, upon the richness of the deposit and the ease or difficulty of raising and treating the karang. In almost every mine the dumps and tailings are worked over by tributers, who pay 10 to 15 per cent of their profit for the privilege. The popularity of tribute working with the Chinese lies in the fact that, though it may not pay so well in the long run as a fixed wage, there is always the possibility of striking it rich. The principal objection to tribute working is that antiquated methods are usually employed and the lower grades of karang disregarded. It is obvious that a tribute worker whose very success may lead to a cancellation of his privilege or to the exaction of an unreasonable tribute is not likely to install modern machinery or treat low grades of tin-bearing earth in a property belonging to another. Therefore it may be said that the decrease of 14,000 in the number of tribute laborers in 1910 as compared with 1909 is an indication of the adoption by mine owners of improved methods and more machinery, an indication which is supported by the fact that the total horsepower (steam, gas, and hydraulic) employed in the tin mines in 1910 was about 10 per cent greater than in the preceding year, reaching a total of 18,515 horsepower.

TAMIL AND OTHER LABOR

Over 75 per cent of the hands now employed in the tin mines are Chinese, the remainder being principally Tamils, with some Malays, Javanese, and Punjabees. The Malays are usually employed only as mill hands and machinists, and the Punjabees as watchmen. On the rubber estates many of the Javanese laborers are indentured for a fixed term, but those employed in the mines are all free labor.

The amount of Tamil labor in the tin mines is steadily increasing, as it serves to supply a deficiency in Chinese labor and thus prevents a demand for any considerable increase in wages.

These Tamils are recruited from the Madras Presidency of India, either by the miner's own representative (holding a Government license) or by the representatives of the Immigration Committee, a body appointed by the high commissioner of the Federated States. The Tamil immigration fund enactment provides that to meet the expenses of recruiting, to provide free transportation of the Tamils and their families to the Federated Malay States, and to maintain a home for decrepit Tamil laborers, every employer of Tamil labor in the Federated Malay States shall be assessed once in three months an amount not exceeding \$1.70 United States currency per quarter for each Tamil laborer in his employ. Furthermore, the act provides that if the returns which the employer is required to make show that the number of Tamil laborers in his employ is greater than the number for which he has provided free passage from India in the two preceding years, a further assessment may be levied for each laborer in excess; the total assessment, however, may not exceed \$1.70 per quarter for each Tamil employed. For the last two quarters of 1911 the rate levied was \$1.135 under the first section of the act, and a further charge of \$0.565 under the second clause.

Coal Deposits

In conclusion, mention should be made of the fact that coal deposits have recently been found near Rawang, in the State of Selangor, which it is hoped will prove of value. The specimens obtained from the trial workings are a low grade of hydrous lignite, but the quality may improve at greater depths. The Rawang Federated Malay States Coal Syndicate (Ltd.), with a capital of £25,000, has been registered in London to develop this field, though it is understood that the Government of the Federated Malay States will retain a controlling interest.

BLACK SANDS OF PARACALE

BY P. R. FANNING AND F. T. EDDINGFIELD

The Philippines division of mines, Bureau of Science, has been carrying on experiments to determine the economic possibilities of black sand and especially the black-sand concentrates caught on the tables of a dredge. A brief outline of the results obtained with the Paracale black-sand concentrates is given in the following article.

The Paracale black sands are made up of the heavy minerals from the rocks and veins in the formation formerly surrounding the placer deposit. These rocks and veins were decomposed and eroded and the heavy particles were concentrated in the alluvials of the Paracale River.

BLACK-SAND CONCENTRATES

Black-sand concentrates are caught on the tables of the dredge and contain the following minerals: magnetite, ilmenite, pyrite, zircon, limonite, pyroxene, olivine, quartz, gold, copper,

metallic iron (partly from the dredge), and galena.

The gold occurs: (1) As nuggets, usually sharp and crystalline, free from other minerals, (2) as crystals bound up with quartz, (3) as crystals with magnetite, (4) as very fine gold free in the sand, (5) as very fine gold in quartz grains, (6) as very fine gold bound up in pyrite.

The dredge treatment of these concentrates recovers the majority of the nuggets and the coarse gold bound up with quartz, but only a small percentage of the very fine gold and practically none of the fine gold included in quartz and pyrite.

It was to ascertain the amount of gold lost and the best method of treatment that these experiments were carried on. A preliminary concentration test was made by panning-table concentrates crushed to pass 40-mesh. The concentrates obtained from panning were separated into magnetic and non-magnetic products. The gold panned out was assayed separately.

Panning, magnetic separation test of table concentrates. a
[Values in Philippine currency.]

	Weight.	Composition, b			Assay.	Value distributed in 1 ton of original.
		Pyrite.	Iron.	Non-metallic.		
	Grams.	Per cent.	Per cent.	Per cent.	Pesos.	Pesos.
Tails ..	10.76	20	10	70	16.82	1.80
Non-magnetic concentrates ..	33.40	50	40	10	128.36	42.88
Magnetic ..	52.41	3	97	....	2.40	1.26
Gold ..	....	....	....	....	....	63.40
Loss in slime ..	3.43	....	....	....	....	101.92

a Original sample assayed 211.26 pesos.

b Estimated by the eye.

A second sample of 200 grams treated in the same manner with extreme care gave:

[Values in Philippine currency.]

	Weight.	Assay.	Value distributed in 1 ton of original.
	Grams.	Pesos.	Pesos.
Non-magnetic ..	91.4	102.80	51.00
Magnetic iron ..	107.5	13.20	7.08
Gold ..	....	....	91.78
Loss ..	1.1	....	61.40

Some of the free gold is coated with iron rust and consequently is difficult to amalgamate; the crushing also liberated more free gold than an original sample would contain; this is shown in the following amalgamation test on the original sample:—

Amalgamation test on original table concentrates.

[Values in Philippine currency.]

Weight of sample.	Assayed original.	Tails.	Gold re-covered.	Gold re-covered.
Grams.	Pesos.	Pesos.	Pesos.	Per cent.
1,033.4	211.26	127.26	84.00	39.7

The amount recovered by panning the crushed sample was 43.4 per cent, and the amount recovered by amalgamation of the original 39.7 per cent. It can not be expected that the dredge could save more than either of these tests and it is probable that it can not save nearly as much.

This sample was supposed to be a representative sample from the dredge, and if this were the case it is apparent that the dredge loses more than 50 per cent. of the gold in the ground. This figure has been confirmed by sampling the dredge tailings, concentrating and assaying them, and estimating the total amount of this class of sand wasted and comparing the result with the output of the dredge.

This does not mean that the dredge loses 50 per cent. of the value of the ground as estimated by drive-pipe tests, for such is probably not the case. The drive-pipe tests themselves show only 50 per cent, or less of the gold actually in the ground for such tests and are analogous to the panning concentration tests given above, where less than 50 per cent. of the gold content is saved as free gold.

METHODS OF TREATMENT OF TABLE CONCENTRATES

Sample No. 1 represents the black sand caught in the tables and riffles of the dredge, and thrown aside after panning out the free gold in the regular cleanup. Sample No. 2 represents the concentrates in which mercury had been used by the dredge during its cleanup. The following tests were made:

Magnetic separation.—The majority of the gold in the sample occurs free (due to improper panning in the dredge cleanup) or in association with the non-magnetic material. Hence magnetic treatment will remove a great bulk of low grade tailings and leave a high grade shipping product. This is shown in the following test:

Magnetic separation test on sample No. 2.
[Values in Philippine currency.]

Products.	Weight.	Weight.	Value per ton.	Gold.
	Grams.	Per cent.	Pesos.	Per cent.
Original ..	3,595	100	100.00	100
Non-magnetic ..	2,100	58.3	170.40	97.21
Magnetic ..	1,495	41.7	7.50	2.79

As indicated by this test, 100 tons of concentrates worth 112 pesos per ton can be separated to give 58.3 tons worth 170.40 pesos per ton and containing 97.21 per cent. of the gold.

Conclusion.—A rich shipping product is easily obtained by magnetic separation of the original product.

Amalgamation tests.—Amalgamation was tried with the original and also after grinding the original through various meshes. A few of the tests are given in the following table:

Amalgamation tests on sample No. 1
[Values in Philippine currency]

Products.	Heads, value per ton.	Tails, value per ton.	Gold saved, per ton.	Gold saved.
	Pesos.	Pesos.	Pesos.	Per cent.
Original ..	211.26	76.80	84.00	39.7
Original put through 60-mesh ..	211.26	67.36	143.90	68.0
Original put through 80-mesh ..	194.20	49.60	174.60	74.4

Original tube-milled, 79 per cent. through 100-mesh. 169.82 15.22 2154.62 91.0
a Variations in sampling or else actual loss of gold by grinding.

The tests were made by revolving the ore in a bottle with mercury and a little sodium hydroxide, for one hour. The mercury was panned out and dissolved in nitric acid and the gold cupelled to give check on the assay of the tailings. It is very unlikely that any machine or system of plates will give an equivalent extraction on the finer meshes.

Conclusions.—Only 39.7 per cent. of the gold in the original can be amalgamated. Grinding releases more and more gold until with very fine grinding 91.0 per cent. of the amalgamable gold is released. Tube-milling, followed by plates, will probably give much less than 91.0 per cent. extraction.

Cyanidation tests.—Cyanidation tests were made on the original, at various meshes and in combination with amalgamation. Important results were obtained.

Test No.	Product.	Extraction by amalgamation.	Extraction by cyanidation.	Total extraction.	Per cent.	Per cent.
1	Original	39.7 per cent	Product not cyanided ..	73.5	34.5	34.5
2	Original	Product not amalgamated.	Product not cyanided ..	89.0	42.1	42.1
3	Original put through 60-mesh	21.10 per cent	57 per cent. in 48 hours ..	96.0	45.4	45.4
4	Original put through 100-mesh	23.16 per cent	82.3 per cent. in 96 hours ..	96.5	45.4	45.4
5	Original tube-milled 98 per cent. through 150-mesh	59.7 per cent	92 per cent. in 48 hours ..	99.0	46.6	46.6
6	Original tube-milled 98 per cent. through 150-mesh	Product not amalgamated	97 per cent. in 48 hours ..	99.1	46.6	46.6

The strength of the solution was 0.29 per cent. potassium cyanide; the pulp ratio was 3:1; the consumption averaged 5 pounds per ton of ore; lime was added and agitation employed in all cases. Tests 3, 4, and 5 were first pulverized, then amalgamated, and the tails cyanided. Test No. 6 was tube-milled and cyanided direct.

Conclusions.—Fine grinding, agitation, and considerable time are necessary, and will give an extremely high extraction. When the coarse gold can not be powdered by the tube-milling, amalgamation may be necessary.

COMMERCIAL CONCLUSIONS

The amount of table concentrates at present saved is too small to warrant the installation of an expensive plant for either amalgamation or cyanidation.

The following table shows the relative advantages of shipping concentrates with and without magnetic separation and of local treatment in Huntington mills.

Comparison of shipment of concentrates and treatment in Huntington mill.

[Values in Philippine currency.]

Items.	Magnetic separation and shipment.	Shipment of original per ton.	Hunting-ton mill.
		Pesos.	Pesos.
Value of original ..	One ton worth 200 pesos separates to 0.58 ton worth 194.42 pesos.	200	200
Cost of treatment ..	16 pesos for 0.58 ton ..	30	2
Extraction ..	185.00 pesos ..	190	140
Profit ..	169.00 pesos ..	160	138

The greatest profit is to be obtained by magnetic separation and shipment of the product. The least profit is to be obtained by treatment in the Huntington mill. The comparison between magnetic treatment and direct shipment is quite close. Therefore, for the present it would be more advisable to ship direct without magnetic treatment. More tests should be made to determine the efficiency of magnetic treatment and the feasibility of installing machines.

FUTURE POSSIBILITIES

The question of how to save the black sands is not within the scope of this paper. It has been shown, however, that after the sands are saved, they can be successfully treated by several methods.

The amount of black sand in the gravel is very large and even rough concentration should give for a dredge some 10 tons per day worth over 30 pesos per ton. Experiments should be made with the Richards pulsator jig and other machines to see if a concentrated product can be obtained cheaply. It might be possible to obtain a considerable amount of concentrates by means of a more extended series of riffles and more frequent cleanups.

With several dredges in operation sufficient concentrates should be obtained to warrant the erection of a central cyanide plant. It would seem that tube-milling in cyanide solution followed by air-agitation, decantation, and the usual precipitation would give an especially high extraction at nominal cost.

AUTOMATIC SPOKE THROATING MACHINE

This Engraving represents the No. 1 Automatic Spoke Throating Machine, manufactured by the Defiance Machine Works, which is used by spoke, wheel and wagon manufacturers to rapidly and accurately throat both sides of spokes at one pass through the machine. It is calculated to handle either small or large spokes in Common, Sarven, Warner, and Sharp-edged patterns at the rate of 12,000 per day, doing the work smooth and securing any shape of throat desired.

The Column is massive and mounted upon a broad, heavy base. The saddles supporting the cutter head spindles are gibbed to the column and provided with a vertical adjustment by hand-wheel to regulate the thickness and position of throat and size of spokes. Both cutter heads can be adjusted together to regulate the position of the throat with the tenon, without altering the adjustment for thickness of throat.

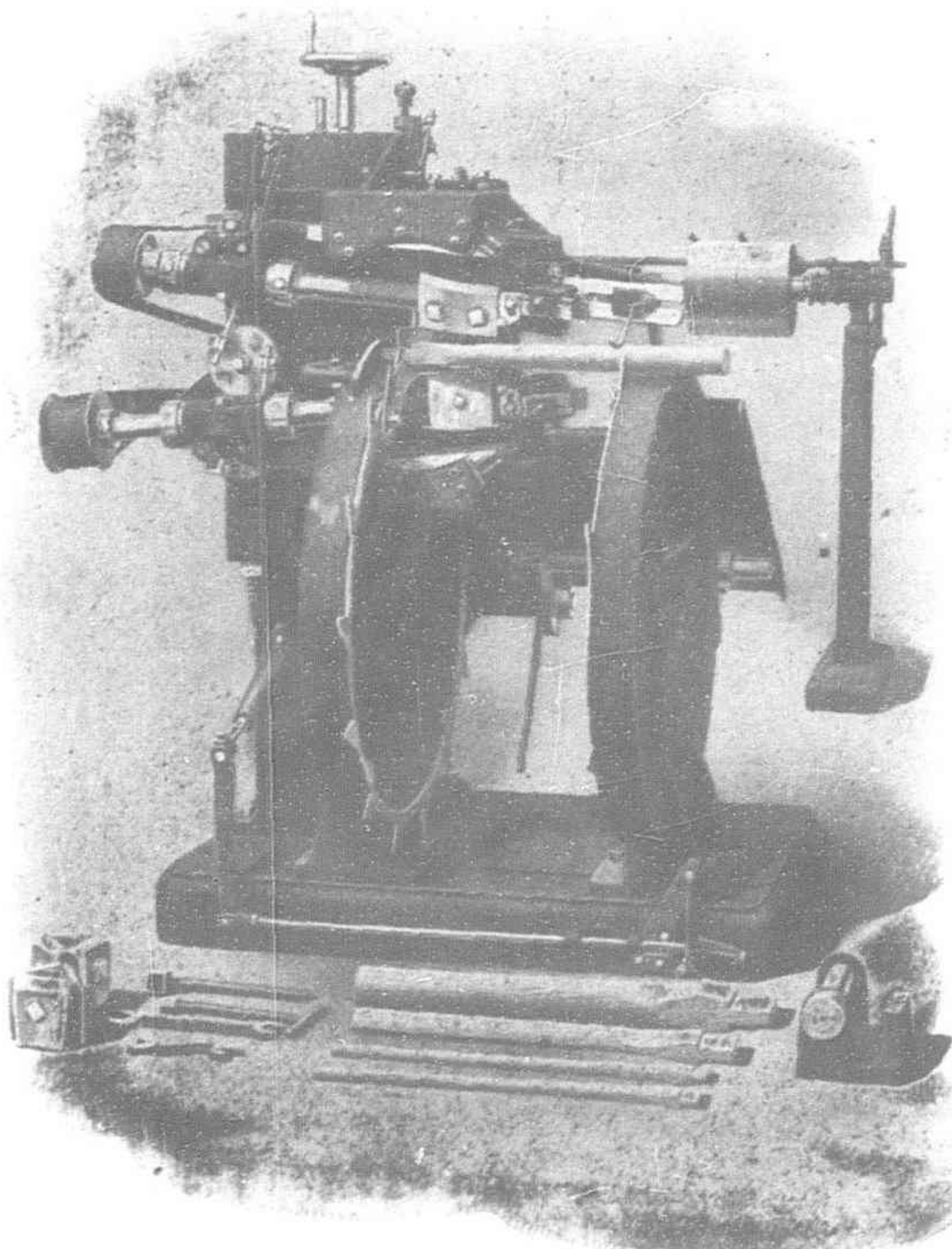
The Cutter Head Spindles are supported in substantial frames, which are attached to the saddles in ball bearings for securing the oscillating movements to the heads. An ingenious equalizing device is fitted to the spindle boxes to secure a uniform oscillating movement

The Feeding Reels are driven by cut gearing and a friction clutch connected by a convenient foot pedal for instantly starting or stopping the feed. The outside reel turns faster than the one on the inside to carry the spokes to the cutter head in a circular path for throating thinner on the face than back of spokes, similar to that important feature secured heretofore by the hand-feed throater. A cam shoe is fitted to each cutter head box near the heads, and as the spokes are fed to the heads the cam shoes travel over the barrel of the spokes and oscillate the cutters in a path to correspond with the shape and size of spoke fed into the machine.

The Spokes to be operated upon are simply placed upon the feeding reels, which automatically present them to the cutters, when both sides are treated at one time and the finished spokes are discharged into a rack at the rear of the machine.

A Counter is furnished as follows: Shaft, 1 1/8" x 60"; two floor stands, 44" high; tight and loose pulleys, 10" x 5"; speed, 1,000 revolutions per minute; one three-step cone pulley for feed.

Further information covering this machine can be secured from its builders, the Defiance Machine Works, Defiance, Ohio, U. S. A.



REPAYMENTS due for to Native and Foreign Loans in September, 1913.

Loan	Instal-ment Number	Due Date	Repayment of Capital & Interest	Total	Chinese Currency	Payee
Kirin-Changchun Railway Loan	8th	Sept. 14	Yen 53,750	Yen 53,750	\$59,125	Southern Manchuria Railway Company
Tientsin-Pukow Railway Loan	11th	Sept. 17	£125,000	£125,312 1/2	\$1,378,437.50	Deutsch-Asiatische Bank.
Industrial Loan	10th	Sept. 25	£125,000	£125,000	\$1,377,750	Hongkong & Shanghai Bank and Chartered Bank.
Shanghai, Chefoo & Taku Main Cable Line.	22nd	Sept. 30	£6,794	£6,794	\$74,734	Great Eastern & Great Northern Cable Co.
Shanghai, Chefoo & Taku Sub-cable Line.	24th	Sept. 30	£1,576	£1,576	\$17,336	Great Eastern & Great Northern Cable Co.
Peking-Hankow Redemption Loan Bonds	10th	Sept. 30	£15,750	£15,750	\$173,250	Dunn Fisser & Co.
Ditto	10th	Sept. 30	Yen 77,000	Yen 77,000	\$84,700	Yokohama Specie Bank.
Ditto	10th	Sept. 30	\$11,893	\$11,893	\$11,893	Bank of Communications, Peking.
Hunan Railway Nationalization Loan	1st	Sept. 30	\$698,000	\$698,000	\$698,000	Bank of Communications, Hunan.

Grand Total \$3,875,225.50

RAILWAY AND TELEGRAPH LOANS

The following is a letter from the Ministry of Communications to the Ministry of Finance regarding repayments of Railway and Telegraph Loans due in September:—

As the railroads and telegraphic establishments under the management of our Ministry were all built with foreign capital, the Government is responsible, as stated in the contracts, for the making up of all monthly deficits in case our Ministry should fail to clear the monthly instalments of capital and interest. For years, however, these monthly deficits for which the Government was responsible had been made up by our Ministry and the sources from which money had come to pay these monthly instalments had been according to the budget of the second fiscal year, the net profits of the three lines, the Peking-Mukden, the Peking-Hankow, and the Peking-Kalgan.

But now things have turned out quite contrary to what we expected. The Peking-Hankow line, for more than one hundred li, has been damaged by flood, which naturally results in diminished income. The Peking-Mukden line has recently been strained financially by the non-payment in cash of the fees on the part of the Government for the transportation of troops. The telegraphic office has not received any pay for the sending of messages from the Central or the Provincial Governments, which amounts to a total credit of more than a million. The Peking-Pukow line now being employed solely for military purposes, all its expenses have had to be defrayed by our Ministry, and so it is needless to say anything of its producing profits or prospect of paying its own capital and interest.

Hence the utter impossibility of our paying the instalments due this month, which have already amounted to the sum of \$3,800,000. At the beginning of this fiscal year, as soon as we foresaw that income would not meet the outlay, we have put, under the heading of receipts, the subheading "loan" to provide for deficiency; but now the income has been so meagre that the conclusion of a foreign loan is for the time being made impossible. Besides the \$500,000 which we have been conceded not to pay temporarily on account of our financial stringency, the whereabouts of the remaining \$3,300,000 is yet unknown.

During this time when the concentration of power over the finance of the nation is to be effected, in conforming to the rule, we hereby submit the following list of unpaid instalments. We will do our best to devise means to dispose of them, but whether we will be successful in our attempt or not, it is yet uncertain. The difficulties we have above enumerated, we cannot help from explaining for fear that trouble may arise from some misunderstanding:—

FAR EASTERN RAILWAYS

CHINA

Peking-Hankow Railway.—The following is a comparative statement of the receipts of this railway for the first seven months of the year:—

January	\$ 557,781.50	\$1,473,813.69
February	331,076.33	685,260.16
March	970,082.21	1,342,299.53
April	1,266,818.78	1,249,222.55
May	1,329,740.03	1,587,388.78
June	912,640.68	1,221,372.44
July	820,761.86	1,127,515.10

Hai-Lan Railway.—The Hai-Lan Railway office at Kaifeng has started buying land for the line, says the *Peking Daily News*, and continues: But for various reasons, there are frequent frictions between the railway authorities and the villagers. In measuring the land, the custom has been to use the bamboo tape, which is less liable to expansion or contraction, but it is said that the railway authorities are using the flax tape, and the land-owners are complaining that the measurements are unfairly made.

The Hukuang Railways.—So many circumstances in connection with the Hukuang Loan for the construction of the railroads from Hankow to Canton and Szechuan were changed by the Revolution and the subsequent failure of the Government to secure a permanent Director-General for the lines, that the Banks interested in the loan were compelled to come to special arrangements with the Chinese Government to provide for the protection of bondholders.

To this end a special conference was recently held in Peking between the chief engineers and accountants of the lines and the Banks, and regulations were drawn up and agreed to by the Ministry of Posts and Communications for the proper transference and disbursement of loan funds. These regulations will ensure the loan monies being devoted solely to the construction of the railways, and will secure for the Chinese a line of the most economic and efficient kind. The regulations are to provide against waste and misappropriation, and the Board of Posts and Communications will surely be pleased to see something being done to this end.

Work is now being pushed ahead on both the southern and western lines, and within a few months distinct progress should be noticeable.

The *Central China Post* of September 5 reports:—The first mile of line has been completed in the Hankow-Canton Railway. Construction work was commenced on August 1, but general work is waiting the discussion now going on in Peking between the Four Powers' banks, the Board of Communications, Mr. Collinson, Engineer-in-chief of the British section, and Linow of the German section. The recent troubles have in some way been the cause of the present delay in remitting the money and the present conference is to contend with conditions that have arisen. The last conference was to have taken place yesterday and prospects are bright that a favourable arrangement will be arrived at. The first piece of construction in this centre is taking place near the glass factory above Wuchang. This is only a branch line to a market on the river. Only about two hundred coolies are at present being employed. The main line will run behind Wuchang to the terminus proper on the river bank on the Wuchang side opposite the German Concession. Here will be the necessary sheds and offices. The position of the terminus was chosen so as to connect the Canton line with the Kin-han railway at Kilometre Ten, connection being made by ferry. There will be placed a specially

planned pontoon on the Wuchang side. This will be fitted with a crane and will also be connected by rail with the shore, so that rolling stock will be able to be transported across the river and run on to the Canton line. The purchase of land is proceeding but is hampered by a boom in the land market which occasions the land owners to value their land at prohibitive prices. Notwithstanding, speed is being made in the erection of the telegraph lines along the route so that there will be ready communication between the different construction centres when work starts. It is expected that the line to the Canton border will be completed in four years and, the Canton province section having been completed by the same time, the journey to Canton will be made in thirty-six hours.

[The conference proved successful, and the engineers have returned to their sections. Mr. Frank Beckwith has gone over the whole of the American section and has located the route. An early start on construction is anticipated. Mr. Beckwith subsequently resigned his post.—Ed. F. E. R.]

Yunnan Railway Project.—The *Hongkong Daily Press* of August 25 says:—We learn that at the end of July, a German firm offered the Provincial Government of Yunnan a loan of £3,000,000 to build the Poseh-Ting railway. The issue price was fixed at 95 and interest required at 5½ per cent. per annum. The agreement contained 22 clauses and, among the stipulations were the following:—

(1.)—That principal should be used, without deductions of any kind, to build the Yunnan-fu-Poseh railway.

(2.)—The actual route of the railway to be decided by the lenders of the money, but in the event of objection by the people to the location proposed, then the route shall be changed.

(3.)—That the Government of Yunnan in the event of their requiring mining machinery, arms, ammunition, munitions or material for war, arsenal machinery, railway machinery, industrial plant or any foreign material or supplies whatsoever, shall give the first refusal of such contract to the lenders, and if the price quoted by them, for such plant, be equal to or lower than other bids, quality being equal, they shall be awarded the contract during the term the loan contract endures.

(4.)—That the lenders of the capital shall have the right to work such mining areas along the line of the railway route, or within a distance to be determined later, provided that such areas are not worked now by native owners or workers.

(5.)—The railway shall belong to the lenders of the capital until the final instalment in repayment of the loan is paid.

"Should such a contract go through," our informant says, "it will destroy all active competition in the province—undoubtedly the richest mining province in China."

Taonanfu-Sinminfu Railway.—The Government projected the Taonanfu-Sinminfu Military Railway some months ago and proposed to construct it at once, in order to facilitate the transportation of troops and supplies to the Mongolian frontier, but the matter was put off for lack of funds. It is said that an appropriation has now been made for this railway, and the work on this line will be commenced very soon. This railway will pass through Changtufu.—*Peking Daily News*.

The Lotung Railway.—When the Government declared that the Lotung Railway should be state-owned, the gentry and commercial people of Honan made violent protests, says the *Peking Daily News*. But since Liu Ko, Manager of the Lotung Railway came to

Peking, negotiations have been progressing smoothly, and it has been decided that the first step to be taken is to try and buy up the shares, thereby testing the attitude of the people. Now the Kaifeng Branch of the Bank of Communications reported that over \$900,000 worth of shares had been bought up by the Government, and as the total capital of the said line being \$1,300,000, the sum represented by this purchase made by the Government was far in excess of 50% of the total capital. This fact indicates the willingness of the people to hand over the control of this line to the Government. The Ministry of Communications has sent Secretary Chen Yuan-sun, and Mr. Chang-ho, to audit the accounts of the Lotung Railway Company. This railway has now been duly taken over. Mr. Orphanides, accompanied by Hsu Wen-chung, Engineer of the line, have duly taken over all the construction works of the line. On August 19th, the Lotung Railway was officially put under the control of Mr. Sze Shao-tsen, Director-General of the Lung-Tsin-U-Hai Railway.

SHANGHAI-NANKING RAILWAY

The following figures of traffic returns (approximately) for the week ended August 16 are issued by the Shanghai-Nanking Railway:—

Year.	For the week		
	Passengers.	Goods and Sundries.	Total for the week.
	\$	\$	\$
1913	22,142	4,819	26,961
1912	35,900	12,174	48,074
Increase.	—	—	—
Decrease	13,758	7,355	21,133

Year.	For thirty-two weeks.		
	Passengers.	Goods and Sundries	Total
	\$	\$	\$
1913	1,488,439	329,688	1,818,127
1912	1,456,434	235,119	1,691,553
Increase.	32,005	94,569	126,574
Decrease	—	—	—

Woosung Line traffic resumed on morning of August 14. Main Line traffic was closed for one day, the 14th instant, between Changchow and Tanyang. Instructions were issued to open up to Chinkiang on the 16th instant, orders were cancelled, however, before being put into operation.

Week ended August 23.

Year.	For the week.		
	Passengers.	Goods and Sundries	Total for the week.
	†23-8-13.	†23-8-13.	†23-8-13.
	\$	\$	\$
1913	24,762	4,642	29,404
1912	36,122	9,859	45,981
Increase.	—	—	—
Decrease	11,360	5,217	16,577

Year.	For thirty-three weeks.		
	Passengers.	Goods and Sundries	Total
	\$	\$	\$
1913	1,513,201	334,330	1,847,531
1912	1,492,556	244,978	1,737,534
Increase	20,645	89,352	109,997
Decrease	—	—	—

† On average of 145 miles open.
Traffic opened for one day only (19th) to Chinkiang.

Week ended August 30.

Year.	For the week		
	Passen- gers.	Goods and Sundries.	Total for the week.
	†30-8-13.	†30-8-13.	†30-8-13.
	\$	\$	\$
1913....	29,008	6,424	35,432
1912....	35,465	7,134	42,599
Increase.	—	—	—
Decrease	6,457	710	7,167
For thirty-four weeks.			
Year.	Passen- gers.	Goods and Sundries.	Total.
	\$	\$	\$
1913....	1,542,209	340,754	1,882,963
1912....	1,528,021	252,112	1,780,133
Increase.	14,188	88,642	102,830
Decrease	—	—	—

†On 161 miles open.

Trains running to Chinkiang from 24th.

Week ended September 6.

Year.	For the week.		
	Passen- gers.	Goods and Sundries.	Total.
	\$	\$	\$
1913....	†32,954	†6,937	†39,891
1912....	41,067	9,599	50,666
Increase.	—	—	—
Decrease	8,113	2,662	10,775
For thirty-five weeks.			
Year.	Passen- gers.	Goods and Sundries.	Total.
	\$	\$	\$
1913....	1,575,163	347,691	1,922,854
1912....	1,569,088	261,711	1,830,799
Increase.	6,075	85,980	92,055
Decrease	—	—	—

†On 161 miles open.

As only one train ran to Nanking on the 6th, it has been disregarded in estimating the mileage open. There was no train from Nanking.

Week ended September 13

Year.	For the week.		
	Passen- gers.	Goods and Sundries.	Total for the week.
	\$	\$	\$
1913....	58,322	6,704	65,026
1912....	38,309	9,432	47,741
Increase.	20,013	—	17,285
Decrease	—	2,728	—
For thirty-six weeks.			
Year.	Passen- gers.	Goods and Sundries.	Total
	\$	\$	\$
1913....	1,633,485	354,895	1,987,880
1912....	1,607,397	271,143	1,878,540
Increase.	26,088	83,252	109,340
Decrease	—	—	—

JAPAN

Joto Light Railway Company.—The Joto Electric Railway Company, promoted by Count Hirosawa Kinjiro and Messrs. Satake Sakutaro, Mochizuki Unai, and Hoshino Seki, held its first general meeting on August 20 at the Tokyo Chamber of Commerce, the shares having all been taken up. The proposal is to lay a main line connecting Yanagishima, Hoiyo and Urayasu, Chiba Prefecture, and a branch line to Matsudo, Chiba prefecture. The total length of the railway will be eighteen miles, and the capital of the company one million yen. Count Hirosawa, the Chairman of the organiza-

tion committee, was in the chair, and made a detailed report on the proceedings of the organization of the company. After the estimates of the company and the organizing expenditure to the amount of 9,000 yen had been approved a few amendments in the articles of association were passed.

Revenue Returns.—The returns of State railways for the month of July were 8,802,312 yen, being an increase of 800,529 yen on the figures for the corresponding period last year. The total returns since April up to the end of July are 37,414,504 yen, with an increase of 1,672,545 yen as compared with the corresponding period of last year.

New Lines.—As a result of the administrative readjustment the construction of new railway lines has for the most part been postponed, but the following fourteen lines being too important to put off are now under construction. They will, according to the authorities, be completed within the next year or so:—

Heavy Railways

Line	Section	Mileage	Date of expected completion
Shinjo....			
Kiyokawa to Sakata		16.57	Dec. 1914
Ganetsu...			
Nozawa to Tsugawa		19.14	Sept. 1914
Murakami.			
Shibata to Chujo ..		8.08	April 1914
Murakami.			
Chujo to Murakami..		12.50	Sept. 1914
Taira.....			
Miharu to Shinmachi		20.66	March 1915
Hojo.....			
Kisaradzu to Minato.		14.63	Jan. 1915
Hamada..			
Oda to Ota		10.61	Nov. 1914
Tadotsu..			
Kanonji to Kawamae		9.63	April 1914
Sarki.....			
Oita to Kosaki ..		11.58	April 1914

Light Railways

Funakawa.			
Mita to Wakimoto ..		5.54	June 1914
Nagai.....			
Nashigo to Nagai ..		7.12	July 1914
Miyachi...			
Kumamoto to Otsu..		13.75	April 1914
Miyachi...			
Otsu to Shimano ..		10.68	March 1915
Oita.....			
Oita to Nakahonda .		7.23	April 1914

Royal Cars.—The Imperial Japanese Railway authorities will construct special railway cars for their Majesties the Emperor and Empress and their attendants to be used on the occasion of the Coronation ceremony next year. The work of construction is to be commenced shortly at the Shimbashi railway works, and the necessary timber is now being prepared. The new cars are to be completed by about August next year.

Abolition of the First Class.—The Imperial Japanese Railway authorities have decided to abolish first-class cars on local services. According to the *Asahi* first-class cars were to be discontinued on trains between Yoshimatsu and Kagoshima, and both first and second class between Yoshimatsu and Tanigashira on the Kagoshima line, from the 16th August. The present system of running three-class trains in Japan was adopted from the English example. The *Osaka* journal considers the *car de luxe* unnecessary on the Japanese trains, which it describes as being no larger than a coffin, but it urges the improvement of the third-class service, a long journey in a third-class car being a severe ordeal. Our contemporary hopes the improvement of the third-class will go hand-in-hand with the abolition of the first.

Increase in Revenue.—According to Japanese papers, the revenue of the Government railways this year has been satisfactory. The total gross revenue for the four months ending July last amounted to ¥37,391,850, comprising ¥19,197,591 receipts from passenger traffic and ¥18,194,259 from goods traffic, an increase of about ¥1,000,000 on estimated revenue. If the present state of things is maintained, it is considered, there can be no doubt that an increase of over ¥3,000,000 will be shown at the end of the financial year on March 31st.

Light Railway at Tokushima.—The Railway Board granted a charter dated September 1 to the Anan Railway Company for the construction of a light railway to connect Hanoura village with Hirashima village in Naga district, Tokushima prefecture. The length of the light railway will be 1 mile and 31 chains, with a gauge of 3 feet 6 inches. The cost of construction is estimated at 65,000 yen.

Konosu-Osama Railway.—The Bando Railway Company has been formed with a capital of ¥1,000,000. The company proposes to lay a line between Konosu, Saitama Prefecture, and Omama, Tochigi Prefecture, with a total mileage of 29 miles, and another line connecting Konosu with Hachioji, 32 miles in length.

Moji Harbour Railway.—Rear-Admiral Takino and other prominent men are planning to start the Moji Harbor Construction Railway at an outlay of 2,000,000 yen. The promoters and supporters of the project will take 30,000 shares, and the remaining 10,000 shares will be offered to public subscription. The proposed railway will, it is expected, facilitate communications between Moji harbor and Sonezawa, thus aiding the business concerns to carry coal to Moji from the neighboring colliery.

Heavy and Light Lines.—As a result of the nationalization of the railways in Japan the expansion of the heavy railways under private management has come practically to an end, while the tramways and light railways have just commenced their expansion. According to the Government Railway Board the private heavy railway companies number ten with a total mileage of 391 miles. Of these seven lines, 253 miles in length, are already open to traffic, while two lines, 103 miles in length, are in course of construction. The building of the remaining lines, which will be 35 miles in length, has not yet been commenced. Light railways being easy to lay and being, moreover, heavily subsidized by the Government, have increased in number remarkably of late years. At present the light railway companies number 208 and the total length of the lines under their management is estimated at 3,328 miles. Of these 38 companies with lines 574 miles in length are already in operation, while 44 companies with a mileage of 800 miles are in course of construction. The remaining 126 companies with a projected mileage of 1,953 miles, are still in the stage of promotion. Besides these quite a large number of applications for the laying of new lines are receiving the attention of the Board. The expansion of the tramways keeps pace with the expansion of the commercial and industrial towns. There are at present 124 tramway companies operating lines 1,082 miles in length. Besides these there are fifty-eight companies which have not yet completed their lines. These will have a total length of 815 miles when completed.

Kokura Railway Co.—The general meeting of the Kokura Railway Company was held recently when Mr. Mudaguchi Gengaku, the president, presented from the chair the business report for the half year, and recommended a dividend of 5 per cent. to be declared. The meeting accepted the report and passed the proposal for the dividend. Mr. Sonoda Sanenori was nominated Adviser to the Company.

MANCHURIA

South Manchuria Railway.—The S. M. R. Traffic Returns for August give Y1,333,966 against Y991,990 for the corresponding month of last year. The aggregate returns since April reach Y7,868,519, being an increase by Y1,839,975.

SIAM

A Proposed Line.—A Bangkok journal makes brief mention of a proposed line of railway to connect with the Bangkok-Petchaburi line at Ban Pong, on the Meklong. If carried out it would no doubt do a great deal to open up a stretch of very fertile but sparsely populated country which possesses great possibilities. Ban Pong is some 111 miles from Bangkok and is quite a thriving place. The line would no doubt prove of great benefit in linking up lower Burma with Siam, and thence with the Federated Malay States and Straits Settlements.

The Northern Line.—In a letter from Chiangmai, dated the 24th July our (*Bangkok Times*) correspondent stated that work on the tunnel at Khoon Tan was proceeding satisfactorily. Enquiries made at the Royal Railway show that the top-heading on the Lampang side is 75 metres in, and the bottom 40 metres, and on the Chiangmai side 85 metres and 10 metres respectively. Work is not being pushed at all, and indeed would not be undertaken in this particular place were it not absolutely necessary. But by the time the rails are at Khoon Tan it is hoped the tunnel will be finished. But for that fact work would not be continued there, as the cost of the same is almost prohibitive. To give an instance, what is known as a big barrel of cement in Bangkok is equal to ten small barrels up-country, and each retails at one tical. The transport from railhead to the tunnel adds another Tcs. 2.25 on to each barrel. But still the cement is absolutely necessary, as at least part of the tunnel must be lined. The Laos labour at work here and elsewhere along the line varies of course according to the season of the year—naturally during planting time the supply is smaller, but the system of utilising Laos labour is not to be changed. Nearly two years' experience with these men has proved that they are cheaper than Chinese. Moreover the money they earn stays in the country. Some idea of the proportion of Chinese to local labour employed may be gained from the following figures. In the section from Den Chai to Lampang, under the charge of Mr. Altmann, the number of men employed during June was Lao 1,170, Chinese 200. On the further section, Lampang to Khoon Tan, a few hundred more men are working; the bulk are working in their own country.

The next stretch of line to be opened will be to a place called Pak Tar, where the Meh Tar stream joins the Meh Yom. It is situated some 30 kilometres from Den Chai and 503 from Bangkok. It is proposed to open this line on November 1st. This brings the railways to the banks of the Meh Yom which has to be bridged by three spans of fifty-eight metres each. During the last dry season the piers were placed in position, and in the coming dry season the iron superstructure will be erected. A good deal of material was carried over this river last dry season. A track was made across the river bed and much of the permanent way material for the line ahead moved. By this means it is hoped to reach Bang Pin next month with plate laying. This will be the next section to be opened, and may be in use as and from April 1st next.

Bang Pin is four kilometres away from Muang Long, and about an hour's walk. The latter place is the seat of the Amphur. Now in the rainy season a ferry service is being maintained across the Meh Yom to transport goods as required. Just beyond Muang Long the line reaches the foot of the hills. To avoid running round a somewhat lengthy spur of some

eminence it was decided to have a short tunnel of some 140 metres. The top heading of this is already through and although the roof proves to be a hard slate it has been deemed advisable to line the roof, and this is now being done. The line here is really at the foot of the Bang Puei pass, and this involves heavy work. There will be no tunnel, but a big cutting has to be made. It is hoped to have the line running to Lampang by the end of 1915, and in any event it will be ready early in 1916. To Chiangmai, 756 kilometres from Bangkok, by train will be possible two years later. The work of preparing for the actual way of the line across the great rice plain leading from Lampang to Chiangmai is being carried on.

One of the problems which the next few years will solve is whether the line will be utilised by the timber firms to transport timber. On this point it is difficult at the present time to pronounce definitely, but in railway circles the view is held that ultimately the railway will give a cheaper transport to Bangkok than by river. At present it is no unusual thing for logs to take some two or three years to reach Bangkok, and a writer in the *Times* last year gave it as five years from forest to mill. The capital locked up in this way must run into big figures.

Now that the line has reached the Meh Yom, in two days from there logs could be delivered into the Menam Chao Phya from the riverside station at Bangkok. For logs coming down the Meh Yom, Pak Pan and Pak Tar would both be good places for loading on rail. It is also quite possible that better places could be found hereabouts, as the line follows the river for some distance. Anyone who has seen the Meh Yom when jammed with logs and no water to float them, will agree that a case has been made out for a trial of transport by rail. It is said that logs cost nothing to float, but there are certain charges to be met, and whether a log is floated or carried on rail makes no difference to its condition—they are seasoned before being floated. Of course approaches would have to be made, and winches installed for loading, and before any definite arrangement could be come to the authorities would have to largely increase their present stock of timber drags. In Burma, we understand, the railways are more and more used for the conveyance of timber. The railway now being built will not open any new teak areas, but will provide an alternative to floating. That the changing conditions are being realised may be inferred from the fact that inquiries as to probable cost of transport by rail have been made. If the railway view is correct, Pak-nampoh as a riverine revenue station will have much less to do in the future than it has now. Millers would also be able to keep their mills running the year round, instead of having to shut down when a succession of short deliveries reduces stocks to too fine a point.

Paknam Railway Co.—At the forty-fourth ordinary general meeting of this company the following report was submitted:—Your Directors beg to submit to the shareholders the statement of accounts for the half-year ended 30th June, 1913.

Gross Receipts	Tcs. 94,381.78
Expenses	" 25,534.76
Leaving a profit for the half-year of	Tcs. 68,847.02
Written off Concession	Tcs. 14.70
Depreciation	" 6,955.00
	Tcs. 61,877.32
Balance from half-year ended 31st Dec., 1912	" 2,430.38
Available for distribution	Tcs. 64,307.70

This amount was apportioned as follows:—
By paying a dividend of 9½% Tcs 47,500.00
By paying Directors' Fees " 5,000.00

By paying Auditor's Fee	Tcs. 390.00
By paying Manager's Bonus	" 2,375.00
By paying Staff Bonus	" 800.00
By carrying to Statutory Reserve	" 2,665.62
By carrying forward to next half-year	" 5,577.08
	Tcs. 64,307.70

GENERAL

Sino-Japanese Through Traffic Agreement.—The Sino-Japanese Through Passenger Traffic Agreement was to come into force on October 1st.

For through passenger traffic between the Peking-Mukden Line and the Chosen Railway through the medium of the intervening Mukden-Antung Line, the following through traffic stations have been named:—

IN CHOSEN

Fusan, Nandaimon (Seoul), Pingyang, and Chinnampo.

IN CHINA

Hsinmintun, Shanhaikwan, Tientsin, and Peking.

The availability of through tickets between the Chinese and Korean Lines is fixed for 20 days, whilst those between the Japanese Government Railways and the Peking-Mukden Line will hold good for 30 days.

The free weight limits of passengers' baggage are agreed upon as follow:—

For a 1st class passenger.....	150 lbs.
" 2nd " "	100 "
" 3rd " "	80 "

The difference in the standards of currency in Japan and China is a source of great trouble to the Railways concerned in the distribution of their respective proportions, but they have agreed that in principle the passengers' interests shall have precedence in the exchange process.

The majority of through passengers between the S. M. and the Peking-Mukden Lines being coolie immigrants and emigrants riding the lowest class, the S. M. Railway will continue to calculate the respective shares of receipts from this particular source by its official exchange rate as it fluctuates from time to time, and will also continue to issue through tickets at the stations specified for the purpose in a separate agreement between the two Railways.

Projected Lines.—It is reported at Peking, says the *China Critic*, that the Chinese government has in view several railway schemes in South Manchuria. One of them is to lay a line between Tiehling and Mafengkou (the river mart on the Liao), another from Kaiyuan to Sunchatai, a third from Antung to Tashihchiao via Tatungkou and Hsiuyen, and a fourth, and the most important of all, from Kungchuling to a Mongolian trade centre.

BRITISH NORTH BORNEO

British North Borneo Lines.—Speaking at the 61st half yearly meeting of the British North Borneo Company on July 15, at London, the Chairman of the Court of Directors, the Right Hon. Sir West Ridgeway, said *inter alia*:—With regard to the railway, a considerable amount of work was carried out during the year in reconstructing and strengthening the line and in repairs to and renewals of locomotives and rolling stock. This included an expenditure of £31,988, which has been charged to capital. You will observe that the auditors in their report take exception to our having charged to capital the sum of £13,961 thus expended in the reconstruction of the line. They made the same objection last year, and I went fully into the matter. I stated:—"With regard to the railway, you will remember that I told you at the meeting here last July that the cost of improving the line and bringing it into a proper and efficient condition would not fall short of £100,000. In the year under review we have

spent about £28,000 in improving and strengthening the line. In this connection you will observe in the auditors' report that they take exception to our having charged to capital the sum of £5,643 expended on the reconstruction of the line (which is included in this sum of £28,000), they being of opinion that that amount should have been charged to revenue. This railway was in the first instance constructed with rigid economy, merely as a pioneer line, and was intended to attract capital to the country and to promote the opening up of rubber and other industries. Accordingly it was decided that the whole of the expenditure should be fairly and properly chargeable to capital. Now, owing to the great increase of traffic, in consequence of the establishment along almost its whole length of a number of rubber companies, we have decided to reconstruct the whole line and make it into a strong and durable railway. In order to do so we must resleeper the line, substitute heavier rails than those hitherto in use, strengthen or rebuild the bridges, and very largely increase the number of locomotives and rolling stock. It is estimated that the cost of this work will be over £100,000, and I promised you last year that it should be charged to capital, and unless you wish us to charge it to revenue we propose to adopt this policy, which we consider to be sound and fair to the shareholders. I may point out to you that even when we have expended the £100,000, to which I have referred, on the reconstruction of the line, the total cost of the whole 125 miles with ample rolling stock and full equipment will amount to less than £700,000, or about £5,400 per mile. That amount compares most favourably with any other railway in a tropical country."

The net railway revenue for 1912, as I have already mentioned, shows a considerable increase over 1911, the gross earnings amounting to £20,911, as against £16,936 in 1911, an increase of £3,975. The total number of passengers carried in 1912 was 201,877, against 175,339 in 1911, showing an increase of 26,538. With regard to the goods and other traffic there were 14,184 tons carried in 1912, against 10,451 in 1911, an increase of 3,713 tons, whilst the number of head of live stock carried also shows a small increase. Since the beginning of the year 1913 the increase in the receipts has been steadily maintained, the total for the five months ending May 31 last amounting to £9,858, which gives an average for the whole year of £23,650, or an increase of more than £2,700 over that of 1912.

During this year considerable work will be done in relaying the main line with heavier rails, 60lb. rails being substituted for the 30lb. rails now in use; much will also be done in strengthening the bridges, the wooden structures being replaced by steel work, thus making them strong and permanent. Another scheme in hand is the removal and extension of the locomotive workshops, the present buildings being too cramped and the site too small to admit of extension. All this work, although involving considerable capital expenditure, will, as time goes on, amply repay us by the increase receipts.

The railway rates charged are very reasonable.

PUBLIC WORKS

Schemes in Siam.—The Government has a scheme in view for constructing a road across the peninsula from Langsuen to Renong, and an engineer is to be dispatched by the Ministry of the Interior to survey it.

The lock at Bang Hai, which is constructed to prevent the salt water getting in from the sea at Bangkok, is now completed. The work was commenced about nine years ago under Mr. Van der Heyde, and originally estimated at G. \$111,250; the total cost has been about G. \$222,500. The work consists of a tidal sluice to prevent the salt water going up the klong, a navigation lock, and an earthen dam, and at this point the klong is 300 feet wide and 26 feet deep. It is hoped that by this work the large area of the land drained by Klong Bang Hai will be reclaimed for cultivation.

IRON AND STEEL

Angat (P. I.) Iron Mining Co.—Incorporation papers have been filed with the archives division of the executive bureau at Manila by the Angat iron mining and smelting company. Its activities are given as the development and exploitation of iron mines in the Philippine Islands; the buying and selling of mines; the reducing of ore by smelting, etc. The capital stock is P100,000 and is divided into 4000 shares at a par value of P25 each. P20,000 has already been subscribed and P14,000 paid into the treasury.

Pig Iron.—It is reported that the restoration of the accommodation of the Hanyang Iron foundry has been completed, and it is now turning out 600 tons of pig iron daily. The first consignment of 2,600 tons was sent to Japan recently. Of the annual output of 216,000 tons, it is reported that arrangements have been made for importing 100,000 tons to Japan this year. Besides this, Japan foundries have contracted for the importation of about 30,000 tons from the Tata Iron & Steel Company of India. The report on the irons from this company's works, made by Messrs. Pattinson and Stead, of Middlesbrough, states that "they are all of very excellent quality, and owing to their richness in carbon and lowness in sulphur, would bear mixing with a very large amount of scrap iron; but better results would be obtained by an admixture of close forge Tata iron, low in silicon and carbon and high in sulphur. Taking the price of Hematite pig iron at an average of 66s. per ton and Cleveland pig iron at 55s. per ton, the market price of Tata pig iron on the average would be approximately 64s. per ton. The present price of Hematite pig iron is 82s. per ton and of Cleveland pig iron about 64s. per ton. Reckoned on these bases the price of Tata pig iron should be approximately 78/3 per ton."

SHANGHAI TRAMWAYS

The returns of the Shanghai Tramways (Foreign Settlement) for the week ended August 20, are as under:—

	1913.	1912.
Effective receipts (after deducting loss by depreciation of subsidiary coinage)	18,660.66	15,003.40
Passengers carried	984,227	783,134
Car miles run	59,354	52,771

The loss by depreciation of subsidiary coinage for the week was \$5,515.98 equal to 23.93 per cent. of the gross cash collected on the cars as compared with \$4,483.01 equal to 24.45 per cent. for the corresponding week last year.

Week ended August 27, 1913:—

	1913.	1912.
Effective receipts (after deducting loss by depreciation of subsidiary coinage)	17,954.34	14,503.29
Passengers carried	963,978	761,602
Car miles run	59,321	50,923

The loss by depreciation of subsidiary coinage for the week was \$5,425.29 equal to 24.39 per cent. of the gross cash collected on the cars as compared with \$4,336.51, equal to 24.53 per cent. for the corresponding week last year.

Month of August, 1913, and eight months ended August 31, 1913, with figures for corresponding periods last year.

	August, 1913.	August, 1912.
Effective receipts	\$ 83,223.99	\$ 68,321.88
Passengers carried	4,404,056	3,565,223
Car miles run	262,613	236,191
Loss by depreciation of subsidiary coinage	24,666.08	20,436.80
Percentage of loss by depreciation of subsidiary coinage	23.99	24.42

	8 months ended Aug. 31, 1913.	8 months ended Aug. 31, 1912.
Effective receipts	\$ 593,314.86	\$ 517,760.46
Passengers carried	30,301,293	26,334,708
Car miles run	1,881,732	1,829,324
Loss by depreciation of subsidiary coinage	165,734.97	159,772.59
Percentage of loss by depreciation of subsidiary coinage	23.09	25.12
Week ended September 3, 1913:—		
Effective receipts (after deducting loss by depreciation of subsidiary coinage)	19,255.90	16,497.76
Passengers carried	1,029,264	868,295
Car miles run	58,731	54,119

The loss by depreciation of subsidiary coinage for the week was \$5,697.03 equal to 23.93 per cent. of the gross cash collected on the cars as compared with \$4,936.90 equal to 24.32 per cent. for the corresponding week last year.

Week ended September 10, 1913:—

	1913.	1912.
Effective receipts (after deducting loss by depreciation of subsidiary coinage)	18,508.54	16,173.85
Passengers carried	1,003,423	846,822
Car miles run	56,251	53,465

The loss by depreciation of subsidiary coinage for the week was \$5,465.33 equal to 23.99 per cent. of the gross cash collected on the cars as compared with \$4,739.52 equal to 23.97 per cent. for the corresponding week last year.

Week ended September 17, 1913:—

	1913.	1912.
Effective receipts (after deducting loss by depreciation of subsidiary coinage)	19,255.77	15,635.42
Passengers carried	1,043,245	823,944
Car miles run	56,833	52,502

The loss by depreciation of subsidiary coinage for the week was \$5,630.73 equal to 23.78 per cent. of the gross cash collected on the cars as compared with \$4,629.64 equal to 24.25 per cent. for the corresponding week last year.

WATERWORKS, IRRIGATION, ETC.

Dairen City Waterworks.—The question of extending the installations at the source of water-supply for the Dairen Waterworks service was brought up again at the recent budget conference of the Kwantung Government. The estimate, amounting to about Y1,300,000 for employment over four years was passed. The appropriation for the next fiscal year is about Y300,000. As the very nature of the question brooks no further haggling for financial or other reasons, it is very unlikely to be shelved again as it was this year.

Tokyo Water Works.—The following information is from the report by the British Vice-Consul at Yokohama (Mr. C. J. Davidson) on the trade of that district in 1912:—A plan to extend the Tokyo waterworks system is now under consideration by the municipality. The present system, which was designed to supply some 1,500,000 persons, is considered quite inadequate in view of the rapidly increasing population, which is now estimated as exceeding 2,000,000. It is proposed, therefore, to expand the system so as to provide water for 3,000,000. For this purpose a reservoir is to be constructed at a spot some 25 miles to the west of Tokyo, from which point the water will be conducted by underground pipes to a distributing centre six miles from the capital, where it will pass through filter beds before being supplied for consumption. Of the estimated cost the Treasury will be asked for a grant of some £714,000—or one-third—the remainder to be raised by means of a municipal loan.

SHIPBUILDING

The Taikoo Dockyard and Engineering Co.—A Hongkong paper reports as follows:—The Taikoo Dockyard and Engineering Co. of Hongkong, Ltd., have just completed a very finely modelled steel screw steamer built to the order of the Bureau of Customs, Manila. The vessel has been named "Gilbert," and is 165 feet long over the figurehead, 25 feet beam, and 15½ feet moulded depth, and has been built equal to the highest classification of Lloyd's Society.

The vessel, with its clipper stem, surmounted with a neatly carved eagle and sweeping trail-board, and long overhanging stern, has a graceful, yacht-like appearance. She has a continuous main deck with long shade deck over, and is rigged as a fore and aft schooner.

A powerful quick warping windlass is fitted in the bows to handle the stockless anchors. The crew are berthed under the main deck forward, and abaft the crew space is a large fresh water tank, also a magazine fitted up with the usual flooding and draining arrangements.

On the main deck forward is a steel house containing rooms for engineers, pantry, bath and saloon. The saloon is handsomely fitted up in polished teakwood.

The captain and officers are accommodated in a teak house on the shade deck. On the after part of the shade deck is a teak house containing Suite de Luxe, panelled in oak and furnished in the most approved manner. Midships on the shade deck is a house for the wireless operator.

Triple-expansion engines and two powerful boilers of the builder's own make have been fitted.

The steam steering gear is housed at the aft end of the engine casing and a Remington refrigerating machine has been fitted in a similar compartment at the aft end of the casing, with a large cold storage compartment under the main deck aft.

The vessel is fitted throughout by electricity and has a powerful searchlight fitted on the fore mast.

Launch of the "Tai Shan."—The Tai Shan, built to the order of the Hongkong, Canton and Macao Steamboat Company by the Hongkong and Whampoa Dock Company, was successfully launched from their yard at Kowloon recently. Mrs. H. P. Holyoak performing the launching ceremony. The Tai Shan is a steel twin-screw vessel constructed to Lloyd's requirements, and the equipment is in conformity with Board of Trade regulations. Her chief dimensions are length over all 290 feet, breadth at main deck 53 feet, and moulded depth, 12 feet. The stability of the vessel, which is shallow draught, is ensured by water ballast tanks fitted all fore and aft, on the cellular system. There are three decks, providing ample accommodation for passengers who when the vessel is complete will find that she bears favourable comparison to the rest of the company's fleet in the matter of provision for their comfort. The carrying capacity is 397 tons on a mean draught of 8 feet 1½ in., the vessel being designed for a speed, when so laden, of fifteen knots. That this speed will be attained on trial is anticipated, the machinery being capable of 3,000 indicated horse-power steam being generated in four single-ended boilers working at 180 lbs. pressure.

King of Siam's New Launch.—Although the motor launch is frequently patronized by royalty, it is not often that sleeping accommodation is provided in any but the largest yachts. In this respect, therefore, the large cruising launch now completing by Messrs. Dixon Bros. and Hutchinson, of Southampton, for His Majesty the King of Siam is different from the majority of royal launches. In cases where economy of space and cost are no consideration, the designers of motor craft are left free to produce a vessel which will command admiration by reason of the luxury which

it suggests, and the broad scale upon which its accommodation is conceived. The launch in question is 55 ft. in length over, all with 10 ft. 9 in. beam, 5 ft. 3 in. moulded depth amidships and 3 ft. draught. She is driven by twin screws, power being provided by pair of 75 h.p. petrol motors fitted with reverse gears. When completely fitted out for a cruise, and with passengers and crew on board, the total displacement of the launch is 15.7 tons, and in this condition it is expected that a speed of 16 knots will be attained.—*Siam Observer*.

MINING

Chosen Gold Mines, Ltd.—At the 1st ordinary general meeting of shareholders of the Chosen Gold Mines, Ltd., held at the Company's registered office at Caxton House, Westminster, London, the Directors submitted the following statement of accounts to the shareholders:—

The Directors beg to submit herewith Statement of Accounts, duly certified by the Auditors, covering the period of fifteen months, from the incorporation of the Company when it took over the property of the Korean Exploitation Syndicate, to May 31st, 1913.

The period under review has been devoted solely to prospecting and developing work, which the Directors are glad to be able to say has proved, on the whole, satisfactory.

The Shareholders have already been afforded an opportunity of perusing the Report recently made upon the Kok Kang Kol Mine by Messrs. Hooper, Speak and Company, which Report gives full particulars of the work done at that mine. From this Report they are aware that sufficient ore has been developed to warrant the installation of a small initial milling plant, which is now in course of erection, and it is expected will be in full operation before the end of the year.

The necessary additional machinery required to operate the mine is already in transit from America, and as soon as it reaches Kok Kang Kol the work advised in Messrs. Hooper, Speak and Company's Report will be carried on still more vigorously than is now possible, but already favourable indications have been found at the bottom of the winze put in on the advice of their representative, Mr. A. H. Curtis.

The following particulars will afford a good idea of the work that has been done since the incorporation of the Company.

In order to comply with the laws of Japan and to enable the Company to operate in Chosen (Korea) it was necessary that it should be officially recognised by the Government Authorities in Korea, and it was not until the 17th March last that permission to establish the Seoul Branch Office was published in the official Gazette. This delay in the recognition of the Company has caused our first year's operations to be somewhat difficult, more particularly in regard to the transfer of the various properties already acquired into the name of the Company. One cause of the delay lay in the fact that the Chosen Gold Mines, Limited, was incorporated almost simultaneously with the promulgation of new laws concerning companies operating in Korea. Official recognition has now been obtained, as likewise of the Company's Agent in Seoul, who has been instructed at all times to render strict compliance with the Japanese Government requirements, which are both reasonable and consistent in character.

The title of the Company to the Kok Kang Kol Mine is now established, the permit being dated 16th May, 1913, over the seal of the Governor-General. The claim had up to then been held in trust for the Company pending its official recognition. The area of the claim is 334,001 tsubo, or about 278 acres, over which the Company has exclusive mining rights. The Company has bought the freehold of such portion of this ground as will be required for surface operations. Transfer of this is now being effected.

The total driving and sinking work done at the Kok Kang Kol Mine during the period under review amounted to 5,346 feet, which covered the sinking of shafts, the driving of the main adit and the various cross-cuts and shafts therefrom. Prospecting work has also been conducted on other claims, notably the Yung Piun, Peh Ju and Koo Sung Mines. The results encountered at the three properties last referred to have not been encouraging, and it is the intention of the Board to confine its entire efforts at present to the development of the Kok Kang Kol Mine, particularly as the erection of the mill will place the property upon a profit earning basis.

Mining in Banka.—According to the *Indische Mercuur* of July 29 the *Java Bode* writes on this subject:—"A few years ago it was decided to proceed with the mechanical working for tin in the Boeboes valley, in the district of Blinjoe, in the Residency of Banka, by means of an electrically-driven sluicing suction installation. The construction of the power station near Mantoeng (in the Klabat Bay) has been delayed, but its completion may soon be expected. The centralisation of motive power in connection with the tin workings will be pushed forward, because the acquisition of wood for fuel for the large number of scattered steam installations is gradually becoming more difficult, and, moreover, proves very costly. For instance, in the districts of Merawang and Pangkalpinang all the available wood in the proximity of the workings is almost used up. Moreover, only certain kinds of wood are suitable for charcoal. In the majority of cases such wood as is not suitable for timber is also not suitable for charcoal. To give an idea of the quantity of wood necessary for the smelting works at Banka we would point out that during the last few years about 200,000 cubic metres of wood have been used per year. It is evident that such an immense quantity of wood cannot permanently be obtained in the proximity of the workings, and that consequently the wood must be obtained at greater distances, and the result thereof is that the charcoal is continually becoming more expensive. Furthermore, a large number of workmen are required to obtain the wood, which workmen could be much better employed at the workings themselves. This difficulty will be felt even more severely in the future if the importation of coolies, which has been fairly satisfactory during the last few years, becomes again more troublesome. It has therefore been decided, in principle, to construct a very large power-station for the districts of Soengeiliat, Merawang, Pangkalpinang, and Soengeislan, the cost of which will amount to more than 1½ million guilders (about £125,000)."

Talacoman (P.I.) Mining Co.—Incorporation papers of the Talacoman Mining Company were filed recently in the executive bureau, Manila. The company will exploit mining claims in the Agusan district of the island of Mindanao. Its directors are John C. Mehan, E. C. McCullough, Patrick Mortimer, E. E. Elser, R. J. Harrison, Alfredo Roensch, and B. W. Rice. Mr. Rice has been elected treasurer.

The capital stock is P.100,000, divided into 1,000 shares of a par value of P.100 each. Of this stock, P.50,400 worth has been subscribed to and paid in.

Kailan Mining Administration.—The total output of the Administration's mines for the week ended August 16, amounted to 38,455.55 tons and the sales during the same period to 32,594.71 tons.

Week ended August 23, total output 35,534.11 tons, and sales during the same period 31,685.27 tons.

Week ended August 30, total output 40,425.83 tons and sales during same period, 31,345.22 tons.

Week ended September 6, total output 34,458.03 tons and sales during the same period 35,929.64 tons.

Siamese Tin.—The report of the Siamese Tin Syndicate Limited states that the year's working resulted in a net profit of £40,822. Two interim dividends of 10 per cent. each, making together 20 per cent., have already been paid, leaving a balance of £16,822, out of which the directors recommend a final dividend of 10 per cent., carrying forward £4,822. The directors have decided to apply the sum £22,745 standing at credit of share premium account in writing off the following amounts from the respective accounts appearing in the balance-sheet:—Preliminary expenses, £740; expenditure in Siam, £18,967; Ngow development account, £2,406; buildings and furniture, £297; boats and lighters, £70; workshop purchase and erection, £248; buffaloes, £15. The returns for the three months to July 1st amount approximately to £15,200, as compared with £11,200 last year for the same period. As the shareholders are aware, No. 2 dredge has already been shipped, and will shortly be on the property. No. 3 is well in hand, and will follow at an early date. Each of these machines has more than double the capacity of No. 1. Since the date of the last report, the company has acquired an option over a property in Malacca, where boring is now proceeding with a view to testing its value. The ordinary general meeting took place in London on the 28th July.

COMPANIES

Bangkok Manufacturing Co.—At the half yearly meeting of this company held recently the accounts for the half year ended June 30, 1913, were adopted. These showed that the gross profits on the Company's operations for the six months amounted to Ticals 46,560.13. From this amount must be deducted the sum allowed for Depreciation as per Profit and Loss Account, viz. Tcs. 14,998.16, leaving Ticals 31,561.97. From this amount must be deducted Ticals 1,629.57 brought forward from last half year, leaving a total available of Ticals 29,932.40, from which must be deducted:—

Staff Bonus	Ticals 2,273.70
Auditor's Fee.. ..	400.00
	<hr/>
	Ticals 2,673.70

leaving a nett amount of Ticals 27,258.70 available for distribution. This amount was dealt with as follows:—

Dividend at the rate of 4 per cent. Tcs.	16,000.00
Directors' Fees	3,000.00
Carry Forward	8,258.70

Japan Paperware Co.—This company has been organised at Tokyo with a capital of Y500,000.

Hokkaido Gas Co.—This company made a net profit during the last half year of Y32,367.34 and declared a dividend of 6 per cent.

Chosen Gas and Electric Co.—This company made a net profit of Y41,048 for the past half year and declared a dividend of 8 per cent.

Grand Hotel, Ltd. (Yokohama).—This company made a net profit during the last half year of Y42,753.73 and declared a dividend of Y5 per share.

Minami Nippon Sugar Manufacturing Co.—This company made a net profit of Y59,320.18 during the last half year, wrote off Y29,489.04 and carried forward Y22,753.58.

Kabuto Brewery Co.—This company made a profit of Y94,516.32 during the last half year and declared a dividend of 7 per cent.

Niitaka Sugar Manufacturing Co.—This company made a net profit during the last half year of Y2,396.39 which, with the balance of Y89,403.92 from the last account, was carried forward.

Shanghai Cotton Manufacturing Co., Ltd.—The appropriation of balance at credit of profit and loss account for the year ended June 30th, 1913, was made as follows at a recent meeting of this company:—

	Tls.
To depreciation	55,749.70
Carry to fund reserve for equalisation of dividends	200,000.00
To reserve for repairs and renewals	100,000.00
Pay to shareholders per share a dividend of Tls. 6.00	
And a bonus of Tls. 4.00	
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Tls. 10.00, viz. :	200,000.00
To credit of new account. . . .	11,747.94
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	Tls. 567,497.64

FINANCIAL

Industrial Bank of Japan.—At a general meeting of the Industrial Bank of Japan, Governor Shidachi announced a fiscal plan to cover the depreciation of the securities in the bank's possession, and the loan to the Hasami gold mine, the recovery of which is considered uncertain. Mr. Shidachi, addressing the shareholders, said that the Bank's investments at the end of June were as follows:

	Yen
National and Prefectural bonds. . .	18,157,158
Shares and Bonds	5,149,701
Gold and Silver mine	3,862,719
Industries	54,202,469
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Total	81,372,047

The total shows an increase of 4,125,833 yen. as compared with that at the end of the previous half year.

"One important proposal which I take the liberty of submitting to you at this general meeting is about the depreciation of the negotiable bonds in the Bank's possession and about bad debts concerning mines. The accounts in this connection had to be adjusted sooner or later, and I believe that we have reached the time when the adjustment should be made. In consequence I propose that we cut down the valuation of the negotiable bonds, appropriating a portion of the reserves for the purposes, and the dividend shall be made for the first half of this year at the rate of 5 per cent. per annum. After this, the bank will be supplied with special industrial funds, so as to increase its revenue. This will enable the bank to increase its dividend and to reserve a fund against the bad debts. This plan was sanctioned by the Government, and it has the promised co-operation of the Bank of Japan and others. Thus an arrangement has been made possible for the bank to obtain the special fund. I regret that we had to reduce the dividend for the term concluded, but hope it will be for the ultimate benefit to the bank." The 5 per cent. dividend was agreed to.

The account was approved as follows:

	Yen
Receipts for the term	2,433,013
Brought over from last term .. .	51,187
	<hr/>
Total	2,484,201
Special reserve	380,000
Dividend Equalization Fund .. .	423,056
	<hr/>
Grand Total	3,287,257
Losses for the term	2,797,757
Net Profit for the term	487,500
Distributed as follows:	
Reserve Against Losses	40,000
Dividend Equalization Fund .. .	10,000
Dividend at 5 per cent.	437,500

Chartered Bank of India, Australia and China.—A telegram has been received from the London Office of this Bank stating that the Directors have declared an interim dividend for the past half year at the rate of 14 per cent., free of income tax. The interim dividend for the corresponding half last year was 13 per cent.

Bank of Chosen.—In the course of his address at the eighth ordinary general meeting of shareholders of the Bank of Chosen (Korea) the Governor of the Bank, Dr. M. Ichihara, said:—"Turning to the country's trade with Japan and other countries, and relation of the Treasury *vis-à-vis* the market, both of which exercise great influence over the money market here, the total amount of trade during the half-year was yen 49,813,090, showing an increase, as compared with the figures for the corresponding period of 1912, of yen 6,141,483, of these figures, the imports, at yen 35,231,712, showed an increase of yen 5,493,958 and the exports, at yen 14,581,378, an increase of yen 647,535, showing an excess of imports over exports for the half year of no less than yen 20,650,334, which is larger by yen 4,846,423 than that for the corresponding half-year of 1912. Thus it will be seen that though imports and exports both increased, the expansion of exports was hardly more than 4.6 per cent., whereas that of imports reached as high as 18.4 per cent., resulting in a 30 per cent. increase in the excess of imports. While an unfavorable trade course is unavoidable in a new country in the course of rapid development as Chosen now is, the difference would not be so great as this, but for the exceptionally unfavorable export trade prevailing for the past few months. Of the articles imported, the enormous increase in the importation of Manchurian millet and foreign rice is a fact worthy of note. It amounted altogether to yen 3,925,576, equal to no less than 80 per cent. of the total increase in the imports. This indicates that the Koreans are forming the habit of consuming cheaper food stuffs while disposing of the more costly rice that they themselves produce—a new economic phenomenon in this country. Turning to the relation of the Treasury *vis-à-vis* the market, the total receipts amounted to yen 107,003,369 while the disbursements totalled yen 117,347,834, showing an excess of disbursements over receipts amounting to yen 10,344,465—a decrease of yen 2,355,851 on the figures of a year ago. This decrease in the Treasury money released on the market, though an unavoidable result of the Administrative Adjustment, proved no small blow to the still rudimentary economic life of this country."

The net profits for the half-year amounted to yen 223,083.98, to which had to be added yen 10,105.16, brought forward from last year, making a total of yen 233,187.14, which was apportioned as follows:—

Dividend at the rate of 6 per cent. per annum on 70,000 shares (30,000 Government shares excepted) ..	157,500.00
Reserve fund to provide for losses ..	39,900.00
Reserve fund to equalize dividends ..	7,250.00
Bonus and Allowances	15,600.00
Balance carried forward to next account	12,937.14
	<hr/>
	233,187.14

The Yunnan Loan.—The Yunnanfu correspondent of the *North-China Daily News* wrote on August 27 as follows:—"The Provincial Government has received the sanction of the Central Government to a proposed provincial loan of \$4,000,000 to be applied to the development of the Kokiuchang tin mines, the purchase of machinery for the Tungchwan copper mines, the purchase of a waterworks plant for Yunnanfu, and various other purposes. Three offers have already been made: one by Carlowitz & Co., whose Hongkong manager recently paid a visit to Yunnan; another by an American syndicate represented by the agent of the Singer Sewing Machine Co., and the last by the Yokohama Specie Bank, whose representative has just lately arrived.

No British or French firms have been able to tender for the above mentioned loan owing to the well-known policy of the two Governments, who discourage provincial borrowing. In this connection some little misunderstanding was caused owing to the fact that Messrs. Carlowitz's representative in this loan, Mr. Laurenz, happens to be a director of the Hongkong and Shanghai Banking Corporation.

Yokohama Specie Bank.—A general meeting of the Yokohama Specie Bank was held on September 10 at Yokohama, and the following account for the first half of this year was approved:

	Yen
Gross earnings	22,308,304
Gross expenditure	18,928,535
Balance: net profit	3,379,769
To reserves	350,000
To dividend (12 per cent per annum)	1,800,000
Carried forward	1,229,769

Mr. Mizumachi, President of the Bank, spoke on the general situation as follows:

The economic condition in Japan during the first half of the year was free from the stringency of last year, but was generally quiet. The foreign trade was brisk and the total of exports and imports reached 68,900,000 yen. The financial world did not have any special cause of depression, but could not be said to be recovering its prosperity.

The money market slackened a little. The Oriental Development Company issued a foreign loan of 20,000,000 yen, and the Government one of more than 100,000,000 yen; the Government at the same time redeemed 5 per cent. bonds amounting to 30,400,000 yen and railway bonds amounting to 45,000,000 yen. It issued Chosen bonds to the amount of 300,000 yen. Towards the end of the term the market tightened slightly, owing to the varied demands for commercial and industrial funds.

In the foreign trade, exports amounted to 284,520,000 yen, and imports to 404,980,000 yen, the total reaching 689,500,000 yen, showing an increase of 55,050,000 yen in exports and of 54,930,000 yen in imports, the total increase being 109,980,000 yen as compared with the corresponding term of last year. The increase of exports was due to the brisk trade in raw silk and habutaye and to the prosperous business done with China. The increase of imports was largely due to rice and Java sugar.

Commerce and industry in Europe were making a wholesome progress on the whole. About March and April, its money market improved and the Bank of England reduced its rates to 4½ per cent. Then the Balkan troubles were renewed, but the Bank of France maintained its rates of 4 per cent., and the Bank of Germany that of 5 per cent.

The Democratic Government of the United States made the merchants and manufacturers doubtful as to its policy, and business was slack. Moreover, the Balkan affair made the European market watchful and America had to export gold to Europe to the extent of \$100,000,000 affecting the financial and stock markets there. Besides, the Paterson strike injured the raw silk trade.

In the Orient, India had a prosperous trade, exporting large quantities of cotton to Japan. North China was not affected by the civil war, and Japanese cotton yarn is selling so well that it is about to beat all its rivals.

Shanghai merchants made various business preparations in expectation of the conclusion of the five Power loan. But as its conclusion was delayed, silver depreciated and there were a few failures as a consequence. When it was concluded the internal strife broke out and the trade did not prosper as expected.

But Manchuria was not affected by the strife and the general trade conditions were normal and the export of Manchurian beans prospered.

VLADIVOSTOK HARBOUR

Vladivostok Harbor.—The increase of trade at Vladivostok has made the question of extending shipping facilities an acute one. Both anchorage and wharfage are far below requirements, and ships have to wait as much as three weeks for their turn to unload. Plans for harbour improvements at a cost of 1,600,000 roubles have been sanctioned by the Russian Government and the work of repair and extension is expected to begin shortly.

PERSONAL

Mr. John Van A. MacMurray, who has been appointed Secretary of the American Legation in Peking will arrive about November 22nd. Mr. MacMurray has been in the Diplomatic Service since 1907, and has served as Secretary of the American Legation in Siam, and as Second Secretary of the Embassy at St. Petersburg. He has been on duty in the Department of State, Washington, since April 1911. Lately he has been the Chief of the Near Eastern Division.

H. E. Sir John Jordan, K. C. M. G., H. B. M. Minister to China, will not be able to leave London for Peking until early in November.

Mr. J. W. O. Davidson of the British Legation at Peking has been transferred to the Consulate-General at Canton.

Mr. E. T. Williams, Charge d'Affaires of the American Legation at Peking, will be appointed Chief of the Division for Far Eastern Affairs of the Department of State at Washington.

With the departure of the Japanese Consul-General Mr. Obata, the senior consulship in Tientsin falls to the American Consul-General, Mr. S. S. Knabenshue.

Dr. Mizumachi, President of the Yokohama Specie Bank, has resigned and has been succeeded by Mr. Junnosuke Inouye.

Captain T. C. FitzHugh, M. V. O., Chief Commissioner for the British Engineers Association at Peking, visited Shanghai during September and met a number of those interested in engineering matters, to whom he explained the aims and objects of the Association.

Sir Charles Eliot, Chancellor of the Hongkong University, who has been in Peking during the summer months studying the Chinese language, has returned to Hongkong.

Mr. Frank L. Crone has been appointed Director of Education in the Philippines in succession to the late Mr. Frank R. White. Mr. Charles H. Magee has been appointed Assistant Director and Mr. John D. De Huff as Superintendent of City Schools in Manila.

The resignation of Mr. Dean C. Worcester Secretary of the Interior, Philippine Islands, became effective on September 15.

It is reported from Berlin that Herr von Haxthausen, German Minister to Peking, intends to return to Peking in the middle of October.

Mr. Müller, Russian Consul-General in Tabriz, has been appointed Diplomatic Agent in Urga.

Dr. Tokichi Masao, a legal adviser of the Government of Siam, who recently resigned his post after many years of invaluable service, was summoned to the Siamese Court recently and, in the presence of Royal Princes and State Ministers, the King personally conferred on him the First Order of the Royal Crown, at the same time granting him an annual life pension of 5,000 ticals.

THE UNIVERSITY OF HONGKONG

(Continued from page 137)

must soon. It is so therefore of national importance to Great Britain that the young men who are destined to control should receive their first and most lasting impressions from British teachers and British appliances.

"I use the words 'national importance' advisedly. It has already been stated in *The Engineer* that American firms offered fully to equip the Hongkong University with mechanical and electrical appliances. When this was made known about fifty British firms sent offers, and I doubt not that what is wanted will be forthcoming before long.

"The German Government officials have urged, and are urging German firms to take a hand in technical education in China, and our other competitors are no less active. In fact, it is recognised everywhere but in Downing-street that the struggle is now a national one, and that the first position to be contested is that of education. Fortunately, we have the vantage ground of Hongkong and a University there with British professors and British tools. This should help us to hold what we have till the British Government acknowledges and acts on the fact that a commercial nation cannot afford to be ashamed of or indifferent to, its commerce.

"Some of the well-known firms of British engineers have already signified their willingness to take post graduates from the Hongkong University into their works for a year or two, and the students are ready to accept their offer when the time arrives. This cannot but be of mutual advantage."

POWER STATION AT BANGKOK

(Continued from page 138)

Co. The concrete is put into wooden moulds over the iron bars, and as the posts are made of a lattice work pattern they are ornamental as well as useful. They are constructed so as to give strength in the direction in which it is required, and are much stronger than the old circular wooden posts. There is an iron continuation at the top as a lightning conductor in conjunction with the iron formation of the posts, which are in two sizes of eleven and eight metres each. The scheme of making these posts is another invention to the credit of Mr. Gollo.

There is a handsome approach to the station, and when all is completed it will form an attractive addition to Bangkok's public buildings. Mr. Shaw is the Engineer-in-charge, and the A.E.G. are the Chief Contractors. It is also stipulated that they run the station for twelve months after its completion.

BRIDGES IN INDIA

A bridge 769ft. in length is, says the *Railway News*, to be built over the Pazundaung Gorge on the extension of the Burma Railways. The work is being undertaken in order to link up the riverside districts of Rangoon. The structure will comprise three fixed spans of 165ft. each, a rolling lift span to give 100ft. clear opening for water traffic, and an approach span of 120ft.

A new bridge is shortly to be erected over the lower Ganges, 120 miles above Calcutta, on the system of the Eastern Bengal Railway. There will be 17 spans, the two approach spans being 75ft. long, the others being 345ft. long, 49ft. high, and weighing 1,400 tons each. The bridge will be the largest ever shipped from England, and, with the exception of the Forth Bridge, it is said to be the largest yet built by British engineers.

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